VOLUME 21
NO. 11

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

NOVEMBER,
1932

Western Office
66 E. South Water St.,
Chicago, Ill.

PUBLISHED MONTHLY BY

THE BRUCE PUBLISHING COMPANY

524-544 NORTH MILWAUKEE STREET
MILWAUKEE, WISCONSIN

Eastern Office
40 East Thirty-fourth St.,
New York, N. Y.

TABLE OF CONTENTS

A Course in Commercial Truck Driving, *by John T. Shuman and Charles S. Smith*..... 313
The Utilization of Waste in Industrial-Arts Shops, *by Max Chambers*..... 316
Research Results for Workers in the Field, *by Louis V. Newkirk*..... 319
Gee, But He's Great, *by Allen D. Backus*..... 321
Editorials..... 322
Patternmaking in the Junior-High-School Curriculum, *by Frank C. Cech*..... 324
Concrete Problems from Homemade Forms, *by William L. Hunter*..... 327

SUPPLEMENTS

Match Box, *by Clifford B. Smith*.....No. 254
Free-Hand Sketching, Plates XI and XII, *by Jonathan Bright*.....No. 255

PROBLEMS AND PROJECTS

Free-Hand, Third-Angle Projection for Beginners in Mechanical Drawing, *by Jonathan Bright*..... 330
A Pleasing Novelty, *by Hazel F. Showalter*..... 330
Upholstered Stool, *by Leslie H. Murphy*..... 330
Circular Saws, Their Characteristics and Use — II, *by John E. Doren*..... 331
Making a Jointed Toy Dog, *by F. Clarke Hughes*..... 332
Modern Book Ends, *by Ira C. Madden*..... 334
An Improvised Bar Clamp, *by Rex Aton*..... 334
A Coöperative Study Fostered by the A.V.A. Committee on Standards..... 335
Planer Jacks, *by H. E. Todd*.. 336

Now, Are There Any Questions?..... 8a
Associations and Conventions.. 8a
News Notes..... 8a
School-Shop Equipment News. 10a

THE A.V.A. CONVENTION

Kansas City is taking its duties as host to the American Vocational Association very seriously, and is exerting every effort to make the seventh annual A.V.A. convention, which is to be held December 7, 8, 9, and 10, a real success.

According to all indications, industrial-arts men will be given a more adequate part in the management of the affairs of this association and a more equitable position on the annual program. If this materializes, industrial-arts men will no longer lack national representation.

Taking this point into consideration, it will be well for every industrial-arts man, who can get away at all, to attend this convention. He will find his attendance to be not only beneficial to himself, but he will help give national expression to his work, and to his profession.

A FEW CONVENTION DATES

Oct. 20. Indiana Vocational Association, Indianapolis.

Oct. 28. Maine Vocational Association at Bangor.

Nov. 3. Iowa Vocational Association at Des Moines.

Nov. 3–4. Wisconsin Vocational Association at Milwaukee.

Nov. 4–5. Illinois Vocational Association at Chicago.

Nov. 11. Missouri Vocational Association at Kansas City.

Nov. 21–23. Industrial Arts Round Table at Rapid City, S. Dak.

THIS MONTH'S COVER

The picture chosen for this month's cover shows two timbermen bucking western yellow pine in the Kootenai National Forest, Montana.

Photo by K. D. Swan. Courtesy U. S. Forest Service.

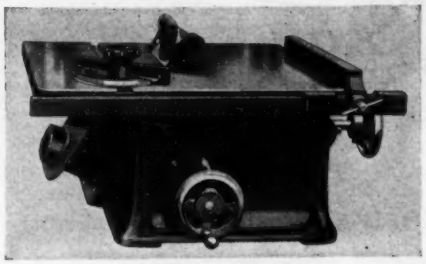
Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1932, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930.

Subscription Information—Subscription price, $2.50 per year, payable in advance. Canadian postage and tariff, $1.00, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

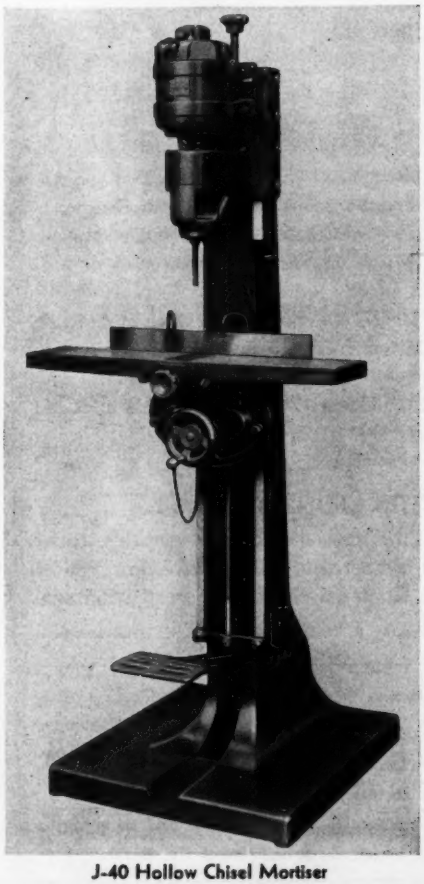
Editorial Contributions.—The Editors invite contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.



J-20 Tilting Arbor Saw

J-31 Hand Jointer



J-40 Hollow Chisel Mortiser

Only good tools will produce good work

ONLY with good tools—tools of the most modern design and construction—can the pupils of vocational and manual training schools learn to do good work. No amount of theorizing can counteract the retarding influence and the discouraging effect on the pupil resulting from poor craftsmanship, which frequently is directly attributable to poor tools.

The three Yates-American machines shown here are excellent examples of modern engineering. They typify the progress in woodworking machinery that has resulted from today's demand for speed, safety and reliability. They exemplify the modern tendency toward greater ease of operation and increased results per unit of effort. They are part of our fulfillment of the requirements of industry which we are pleased to contribute to the progress of vocational education.

Descriptive circulars of these machines will be gladly sent upon request

YATES-AMERICAN

YATES-AMERICAN MACHINE COMPANY

VOCATIONAL DIVISION

BELOIT, WISCONSIN, U. S. A.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOLUME 21 NOVEMBER, 1932 NUMBER 11

A Course in Commercial Truck Driving

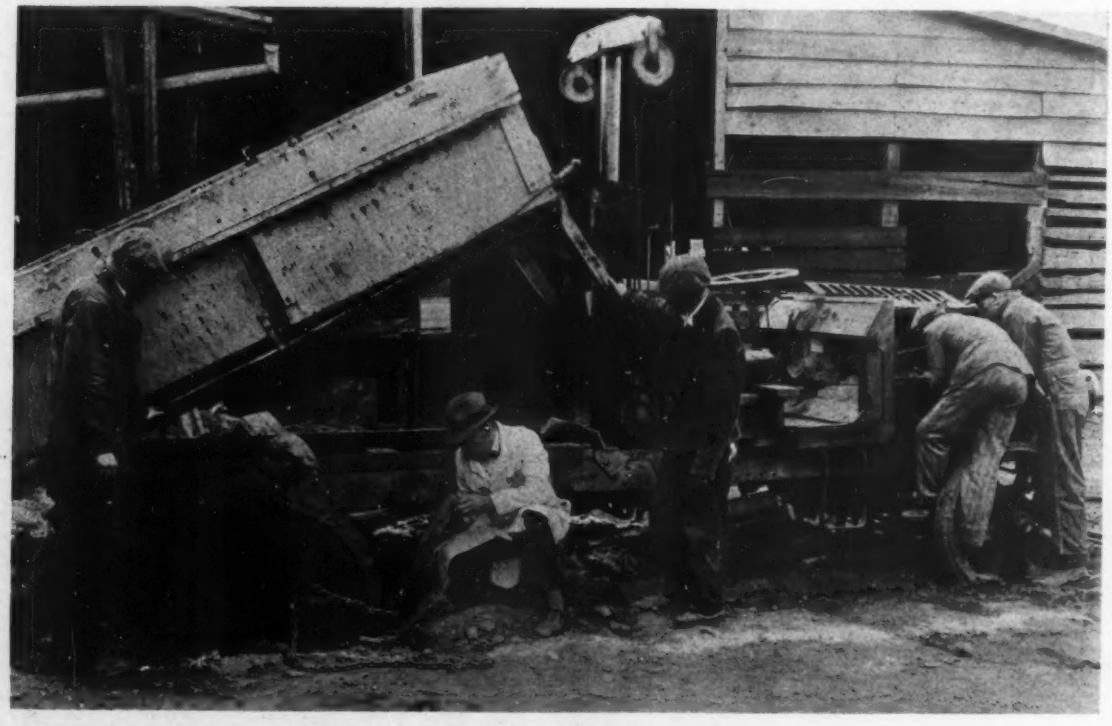
John T. Shuman and Charles S. Smith***

FOR two years the city of Williamsport, Pennsylvania, has been training or rehabilitating unemployed men in its vocational school. An interesting development in this work was the addition to the evening-school curriculum of a class in truck driving. Because of the large number of men with some truck-driving experience out of employment, the possibility of a state road-building program, and the probability that some other local construction work would be started, it was believed that there would be job opportunities for well-trained truck drivers during the next building season. That conclusion has since proved correct.

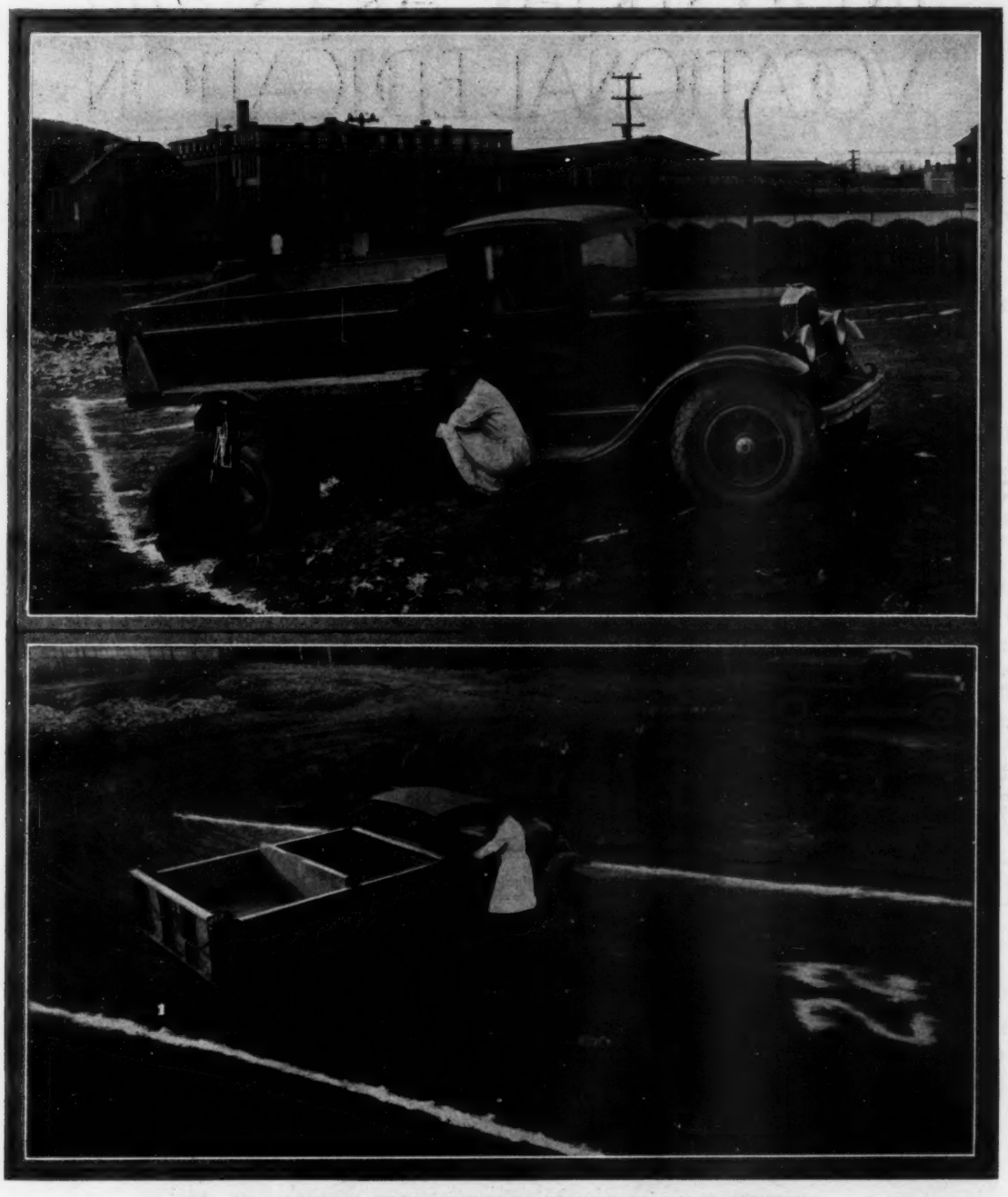
*Instructor Sheet-Metal Work, High School, Williamsport, Pa.
**Instructor Auto Mechanics, High School, Williamsport, Pa.

In order to enter the course the applicant had to meet a definite standard of qualifications. Each man admitted was at least 18 years of age, 5 feet 5 inches tall, weighed not less than 150 pounds, possessed at some time a driver's license, and had had some truck-driving experience. No distinction was made here between experience in driving light delivery trucks or the heavier commercial vehicle. Generally speaking, a man's age was used as a standard of qualification only in view of his past experience and his possibilities of securing work after the completion of the course.

To advertise the course, small posters about 8½ by 11 inches announcing and describing the course were placed conspicuously about the community. In order to



GETTING OUT OF A MUDHOLE



TOP: DIAGNOSING THE TROUBLE. BOTTOM: TURNING ON A 22-FT. DRIVEWAY

find men who might be interested in the course, the records of the various local labor offices were carefully examined to locate unemployed men who might profit by such instruction. These men were then invited to join the class. Similarly, the public evening-school records were examined to locate evening-school students who might study truck driving to much better advantage than the courses they were then following. In this way a total of 44 unemployed men who met the requirements were found and enrolled in the course.

The course, which was based on those abilities and skills expected of a driver out on the highway, consisted of three parts: The first section of eight lessons dealt with theory; the second section of twelve lessons pertained to the maintenance of commercial vehicles; and the third section consisted of driving instruction and practice driving. This sequence was followed rigorously, and every man was required to complete satisfactorily each step in its proper order. The outline of the course is as follows:

First Section

Theory *Eight Lessons*

A clear and simple explanation of the various units, operating principles, and nomenclature of the vehicle.

Engine (includes engine lubrication); electrical systems; fuel systems; cooling systems, frame, and body; front axle and steering gears; rear axle; brakes, tools, chains, hoist, acetylene tank, and accessories. Safety precautions and public relations (state laws and licensings); examination on the material studied and discussed.

balloon tires, and five high-pressure tires that are used on trucks.

Explain the following terms pertaining to tire injuries:

Sand blister	Rim cut	Sidewall wear
Stone bruise	Puncture	Pinched tube
Tread wear	Blow-out	Chafed tube

DRIVING UP AN INCLINE FROM THE RUNNING BOARD

Second Section

Maintenance *Ten Lessons in Shop*

Lubrication and cleanliness (two nights); tires — changing, mounting, and patching; Adjusting brakes and removing brake shoes (two nights); Hoist mechanism — installing gaskets; Tightening up truck — loose bolts, spring clips, etc.; Changing springs; Axle and wheel bearings — adjusting; Transmissions; Clutches; Inspection; Examination in the form of a typical and practical road maintenance job.

Third Section

Driving *Ten Lessons in the Shop and Outside*

Starting truck motor; shifting gears; operating hoist, backing; turning around; getting out of mudholes, etc.; examination.

Every lesson was divided into two parts; namely, the work performed at the school, and the homework done between the meetings of the class. For example, if on Tuesday evening the class studied tire changing, mounting, and patching, the members of the class would be given a list of questions based on this meeting. These questions were then prepared and turned in to the instructor on Thursday evening at the next meeting. Here is an example of a typical outline for a meeting plus the supplementary homework.

Meeting on Tire Changing, Mounting, and Patching

Shopwork

Remove four rims and tires from a truck — two tires shall be from a dual wheel.

Remove the tire from the rim and use a cold patch to repair the tube.

Replace the tube, installing a blow-out patch in the casing.

Mount the tire on the rim and inflate to the correct pressure.

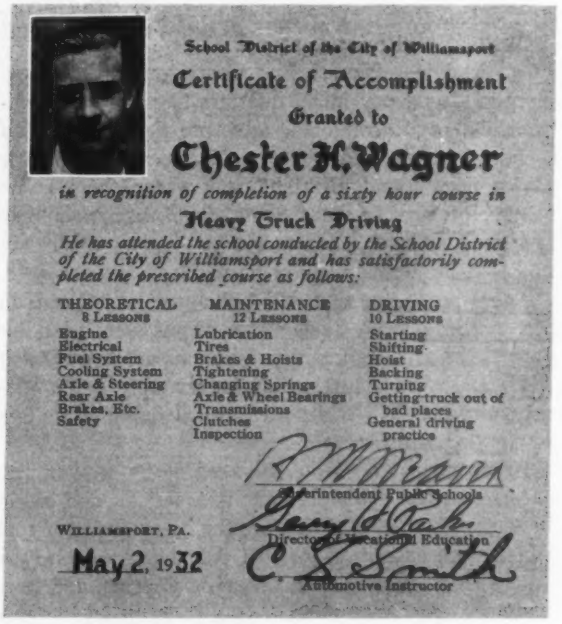
Homework

Name five standard makes of tires.

Give the tire size and the correct inflated pressure of five

Trucks were lent the school by various local dealers representing probably a half dozen different truck manufacturers. Tires and patching equipment were likewise contributed by a local dealer. Instructional material of various kinds was secured from truck manufacturers, coöperating agencies, and the vocational-school library.

Several weeks before the close of the course arrangements were made with a local business organization to give each man one or two days of actual driving under


School District of the City of Williamsport

Certificate of Accomplishment

Granted to

Chester H. Wagner

in recognition of completion of a sixty hour course in

Heavy Truck Driving

He has attended the school conducted by the School District of the City of Williamsport and has satisfactorily completed the prescribed course as follows:

THEORETICAL 8 Lessons	MAINTENANCE 12 Lessons	DRIVING 10 Lessons
Engine	Lubrication	Starting
Electrical	Tires	Shifting
Fuel System	Brakes & Hoists	Hoist
Cooling System	Tightening	Backing
Axle & Steering	Changing Springs	Turning
Rear Axle	Axle & Wheel Bearings	Getting truck out of bad places
Brakes, Etc.	Transmissions	General driving practice
Safety	Clutches	
	Inspection	

Superintendent Public Schools

Director of Vocational Education

Williamsport, Pa.

May 2, 1932

Automotive Instructor

DIPLOMA GIVEN AT END OF COURSE

supervision. To this end, each member of the class actually drove for a full working day a truck for this particular company. The student was, of course, accompanied by the regular driver of the truck and was not paid for the day's work. A report was then sent to the automotive instructor by the manager of the company concerning the ability of the student to handle a truck efficiently under actual working conditions. In many cases these reports proved very valuable in assisting the student and in improving the teaching technique.

The course was closed with a final examination administered by several business men who were employers of truck drivers. The instructor did not participate in rating the students in the following twelve items, which constituted the examination, although he did make up the mimeograph check sheets which the employers used for rating the students:

General Items Covered by Final Examination

1. Preliminary check-up of the truck.
2. Starting the motor.
3. General driving.
4. Backing up to a skip box.
5. Backing a long distance and round a sharp curve.
6. Getting out of a mudhole.
7. Turning on a 22-foot driveway.
8. Driving up to an obstruction on a grade.
9. Leaving the truck.
10. Safety.
11. Street locations in the home community.
12. State and local highway laws.

A small diploma or certificate of accomplishment was given to each member of the class who successfully completed the course. The diploma was small enough to fit readily into the average wallet and contained the man's photograph, name, outline of the course, and the signatures of several school officials. These small certificates were used continuously by the men when seeking work.

Out of 44 unemployed men, who started this rigorous training program, 25 successfully completed the course. Those who did not finish dropped out because of securing employment or because of individual failure characteristics. The entire course has been conceived, developed, and conducted in coöperation with local employers who sincerely believe that efficient truck drivers too must be trained and intelligent men.

The Utilization of Waste in Industrial-Arts Shops

*Max Chambers**

AND Jesus said: "Gather up the fragments that remain, lest they be lost" (John vi. 12–13).

Thus did the Great Teacher give us a powerful example of conservation and salvage after He had fed the multitudes with the five barley loaves and two fishes. His advice, after 1900 years of a constantly changing civilization, still remains sound.

During a depression such as we are now experiencing, there is a tendency in all quarters to reduce expenditures. There are some who advocate that we keep on spending money in order to make times better. Their advice may sound all right, but where there is no money, it cannot be spent. Some schools have no money to spend, and some teachers will be at a loss when they find that they have little or no material to work with.

There are some who will not agree with the plan here outlined, even though it is an excellent plan for normal times as well as depression times. Above all it works, produces results, makes for economy, and is educational in itself. Besides all this, salvaging goods is a fascinating game.

In many instances the salvaged or by-product has superseded the main product in American and world industry. Examples of this are the by-products of coal which were once used for fuel only but now the dyes (more than 2,000 colors), benzol, gas, acids, and hundreds of others have forced the coal itself far into the background. Another is petroleum which in its early days was used merely to produce paraffin, the rest of the crude oil and gas was wasted. Yet today there are pipe lines 1,000 miles long carrying natural gas to consumers who make use of it as a fuel. Even special gas wells are drilled. About the newest thing in by-products is Cellophane which apparently is made of materials used in the manufacture of gun cotton. All glue is a former waste product now salvaged. Fish glue is made from codfish skins formerly thrown away. Animal glue is obtained from hoofs and horns, and casein glue from skimmed milk. Celotex is made of sugar-cane stalks, once an eyesore in the Louisiana landscape, now a valuable product in industry. Cement clinker was once a waste product in iron making. Today it is turned into a valuable cement and is used for a great deal of concrete work. Auto steering wheels are made of straw, potash from banana stalks, cogwheels and pulleys from paper, paper from rags, charcoal from scrap lumber, and cloth from old wool. It is said that wool fiber never wears out and in Yorkshire it is used over and over again. In England the salvaging and detinning of tin cans is an industry. Gas-mask goggles were made from old photographic plates. The fact that the Germans held out as long as they did during the world war, was due to their ability to salvage. They are past masters at it. The German merchant submarine *Deutschland*

*Instructor of Industrial Education, Federalsburg High School, Federalsburg, Maryland.

slipped into Baltimore in 1916, to the amazement of all, with a cargo of by-products, among them 100 lb. of dye, sky-blue in color, which sold for $950! Two thirds of the average tree is wasted.

The main work of utilizing waste in the industrial-arts shop is simple enough and consists of three parts, which are all responsibilities of the teacher.

1. Locating and gathering the material.
2. Disassembling and storing the material.
3. Working out suitable, utilitarian projects, and making the models and drawings for them.

The third part might really come first as it is entirely possible to make quite a few of the projects already in use in any given school shop, from discarded material. The writer is not basing these statements on guesswork. The plan, herewith described, has been in full operation for three years in his own classes.

As in every other activity the teacher must organize and "head up" this program. If this department is not already well and favorably known to the parents of his students and to his community, there is no better way of bringing about this interest than by instituting a program of economy.

A teacher might say, "there are no suitable salvage materials in my community," but the material is there, and it may be found by looking around for it. In most communities there are several good places where help may be obtained. It is advisable, of course, to first talk it over with the principal or superintendent. Then ask the students to look around. Everything that they may bring is of some value, either as a whole or after it is disassembled. After they have seen what may be made of "junk" they will be anxious to bring more. It is well also to tell the Parent-Teachers Association about the plan and ask the members to look around and see what they have in their cellars, attics, and woodsheds. Tell them to inform the first passing schoolboy, so that the material may be promptly called for. The local newspaper editor also should be told. He will gladly give space for an article explaining the work and asking for some of the things needed. Use the school-paper columns. All of these mediums may reach people who are willing to help. If the program is slow in starting, get up a contest among the students. Plan on utilizing the April "clean-up" day which is common throughout the country. Interest local transfer men to haul things too large to carry, to the school free of charge.

Storing the material obtained is usually a small problem, as all of it except the boxes, which are used to store small articles, should be disassembled upon arrival. It must not be forgotten that the student can learn a great deal when tearing down some of this material.

The products obtainable in this way for salvaging purposes differ with the community according to the habits of the people and the type of industries. The list includes just a few easy-to-get articles which are obtainable in most towns for the asking and from them can be made many useful and beautiful projects. Wood has been man's favorite material for ages and because of its abundance and adaptability offers more possibilities than any other material, yet the field embracing articles made of metal has hardly been touched. Then too, there is opportunity for correlation as most of the salvaged material has history. Make use of this fact. What a boy makes is just a by-product of what he learns. Almost any boy can make a project from new material, but when he gets to the point where he can see a bird house or a wall rack or a toy in a discarded wooden box, or a console set or smoking tray in an old auto door or scrap of sheet copper, he is learning something, something that will serve him well in his future efforts to make a living. Thrift and economy are words to be reckoned with at all times.

Even though a teacher may have sufficient supplies, yet in every class there will be a boy or two who has to spoil several pieces before getting one right. Salvaged materials, in such classes, would save new materials, and when the project is properly finished or painted, the old material will be hard to distinguish from the new.

The following articles are desirable, and the teacher will, no doubt, find more, once he has started. They are not listed according to their importance.

Material	What It May Be Used For
Wooden boxes (any size).	Bird houses, many toys, taborets, sand buckets, wall racks, lamps, book ends, puzzles, flower trellises, doll furniture, picture frames, sink racks, garden birds, plant markers, yard dogs, pencil sharpeners, wastebaskets, signs, shoe-shine box, silhouette pictures.
Wood blocks: Stove blocks, fence posts, special cut trees: walnut, hickory, holly, osage orange, cedar, maple, others.	Lathe projects, toy and large chests, laminated lamps, nut bowls, urns, candlesticks, rolling pins, plain lamps, dumbbells.
Boards: Home scraps, any wood, any thickness. Old organs, pianos, furniture, factory scraps.	Book ends, test blocks, flower stands, game tables (tilt and fixed), magazine racks, stools, gun racks, other pieces of furniture.
Roots: Peculiar shapes, dug up or found on new highways or in the woods. Must be dry. Briar, oak, mulberry, laurel, rhododendron, black gum.	Pipes, candlesticks, smoking trays, lamps, curios, model airplanes from black gum or ash roots which is white and almost as light as balsa.
Tree limbs: Twisted shapes or plain, laurel, dogwood, rhododendron, hickory.	Rustic souvenirs, tables, curios, coat hangers, walking canes, gun crotch, log cabins, porch chairs.
Broomsticks—large and small.	Wheels for toys, rollers, handles and bundle carriers.
Tin cans: All sizes, pepper cans to lard cans, old signs. This material may be used whole or cut into sheets.	Scoops, cookie cutters, baking pans, buckets, sprinklers, funnels, cups, desk sets, toy tractors, trains, checker-board tins, pie pans, apple corer, toilet-paper holder, dustpans, others.
Heavy sheet metal: To be	Raised trays, bowls, candle

worked cold. Auto doors, fenders, pans, top borders.	sconces and sticks, door knockers, ash trays, shovels, mail boxes. Finished plain, raised and hammered, dead black or polished.
Art Metal: Copper and brass, old wash boilers, roofing and rain spouting, confiscated retorts, "twisters" and stills, scraps from new building flashings.	Mail box, water heater, desk sets, pitchers, bowls, door knockers, house numbers, fobs. These articles may be plain, hammered, raised, or etched.
Galvanized sheets: Old roofing (flat), old signs (not embossed).	Pipe, dustpans, chicken feeders, water pans, large funnels, hog scrapers.
Glass: Bottles and mayonnaise jars, broken window glass (old bottles are valuable as antiques).	Bottles to hold oils, etc.; lamps, vases, build ships in; jars to keep tacks, brads, screws, etc.; to mix paint in; when mixing paint mix only enough to finish job. Use clean jar each time. Make picture-frame glass from broken window panes. Use scraps to scrape lumber.
Wire: Old telephone, electric and newspaper tie wire, coat hangers.	Bucket handles, wiring edges of pans, cups, etc.; puzzles, toys.
Bar iron: Brake rods, wagon and buggy braces. To be worked cold. Not more than $\frac{3}{8}$ in. rounds or squares or $\frac{1}{8}$ by 1 in. bars.	Pokers, shovel handles, gate hooks, smoking-stand base, hooks and U door bolts and handles, drapery rods, sign brackets.
Pipe: Short pieces, any size or kind.	Use for forming cold metal, ferrules, bushings, practice cutting and threading.
Clay: Plastic pottery clay.	Make turning wheel, mold, carve, glaze, and burn. Bowls, pitchers, vases, trays.
Electricity: Wire, discarded telephone batteries, old appliance motors, generators, heating units.	Obtain experience in locating trouble, taking apart, reassembling, new projects. Make water heater, stove, toaster.
Sandpaper: Woodworking factory, worn pieces, fine or coarse, cloth or paper.	Polish wood and metal.
Oil: Drained motor oil. Allow to stand for 2 weeks and drain off top. (Put spigot in lard can 4 in. from bottom.) Strain through chamois or clean cloth.	Use in oil cans, to polish with pumice stone. Use as stain or to make antique finish.
Carbon paper: From duplicating machine, billing machine.	Copy work.
Paper: Newspaper roll or sheet scraps.	Free-hand and instrument drawing.
Rags: Only clean, specially laundered.	Dusting, wiping, cleaning.

Of course, it may not be possible to get enough discarded material to satisfy all shop needs, although it has been done. Practically all of the fastening and finishing materials, such as brads, nails, screws, bolts, glue, fine sandpaper, stains, fillers, shellac, varnish, paints, and oils will have to be bought or donated. The donation by a local hardware merchant would be a big advertisement for his business. This, too, has been done.

The plan outlined in the foregoing is primarily for the small city of 100,000 or less and the rural schools, but there is no reason why it should not be used elsewhere with equally good results. It will not work, however, unless the school is interested and takes the plan to heart. It is better to choose a small useful project as a start, and then build on that. The rest will come easy. It may be argued that the student will not show the proper care in the use of salvaged material, and will therefore become careless. This will not be true, if the teacher is just as vigilant when his students are using salvaged as when they are working with new material. The related matter, such as science and mathematics, can be applied in this plan as well as any other.

Some school systems allow the student a certain amount of material and supplies, and charge for all used over the specified amount. Some charge for all. Some give all. Each plan has its merits. Probably the "give all" plan is more democratic. The salvaging plan is a "give all" plan.

Some material obtained under this plan will be clean and ready for use, but others may be dirty and greasy. To clean it is a real job, but some of the older boys usually are ready to assist in cleaning these pieces on Saturday, provided a time is chosen which does not interfere with athletic events which they may have scheduled. Old furniture should always be thoroughly disinfected before any work is done on it. Auto doors, fenders, and old copper should be put in a fire to burn off the paint and to anneal it. The boards in a box may be salvaged by knocking out the ends, or hammering on a piece of wood held across the boards being taken off. The nails may be straightened and saved, if necessary. Hot water will clean lard cans. Lye water will remove paint and grease from metal and solid wood, but don't try it on veneer — use paint and varnish remover instead. Tin cans are better when washed immediately after removing the contents. Those who contribute them will attend to this if their attention is called to this item.

Use a fiber or wire brush to clean roots. Sand, a little gasoline, Old Dutch Cleanser, and a thorough shaking will clean dirty bottles. Use nitric acid and paraffin or sapolin to etch, and steel wool to clean copper. Save all the scraps of wood; they make good kindling.

The Federal Government advocates this plan of salvaging waste. Dr. Julius Klein has made several radio talks on the subject and there is a special bureau in the Department of Agriculture to promote this plan. All industries and most municipalities practice it. In 1929 the meat-packing industry sold $64,265,513 worth of by-products which used to cost them money to dispose of. In 1930 the city of Baltimore salvaged more than $68,000 worth of salable products from its incinerators. This means that about one third of the total cost of disposing of its rubbish was saved. One item alone, baled tin cans, out of which sash weights were made, brought $8,000. Mr. Henry Ford is buying and salvaging 60 junk Fords a day, which speaks for itself.

Research Results for Workers in the Field

*Louis V. Newkirk**

NUMEROUS unpublished theses which contain material of value to industrial-arts and industrial-education teachers are to be found on the library shelves at our graduate centers. Many of these theses do not warrant publication but most of them contain some data of value to workers in the industrial-arts and industrial-education fields. These studies deal with objectives, content, organization, testing, equipment, methods, etc. The writer believes it would be a worthwhile plan to examine such studies, and, with the permission of those who made them, make available the pertinent data and conclusions which could be used by the workers in our field.

A Course of Study in Farm Mechanics, by Watters A. Scott, submitted as an M.A. thesis at the University of Iowa, in 1929, is of special interest to teachers of farm mechanics and home mechanics. A very careful study was made of the maintenance and repair jobs done on fifty farms located in the consolidated school district of Spring Hill and Beech, Iowa. Other surveys were analyzed and used along with the author's intimate knowledge of mid-western farming in developing an extensive list of common farm jobs. The jobs are grouped under the following headings: repair of farm implements, farm buildings, fence building, harness repair, care of trees, painting and finishing, auto mechanics, water supply, electrical repair, heating, household repair, general housework, cooking and camping. The rather extensive questionnaire was printed on a chart which was hung in the homes on these fifty farms. On the charts the farmers kept a record of which jobs were done and who did them over a period of twelve months. The charts were checked each month through personal interviews.

The table[1] shown herewith gives the jobs which were done forty or more times during the year and indicates who did the work.

Repair of Farm Implements

Name of Job	*F*	*M*	*S*	*D*	*O*	*T*
1. Replace a tongue in a piece of farm machinery	65	0	8	0	8	81
2. Make a singletree	55	0	4	0	14	73
3. Make a doubletree	50	0	5	0	4	59
4. Put neck yoke on any piece of machinery	29	0	11	0	5	45
5. Make cultivator pegs and put them in	78	0	52	0	10	140
6. Repair a wagon box	47	0	5	0	6	58
7. Repair a hay rack	37	0	11	0	5	53
8. Sharpen or adjust a lawn mower	42	9	18	5	16	90
9. Replace handle in ax, shovel, fork, hammer, hatchet, etc.	126	1	35	0	13	175
10. Make or repair reach in wagon or sled	26	0	12	0	5	43
11. Make or repair little wagon, sulky, etc.	24	0	3	0	27	54
12. Sharpen a plow	34	0	3	0	27	64
13. Sharpen or scour cultivator shovels	43	0	14	0	21	78
14. Repair of machinery with bolts or rivets	146	0	50	0	50	248
15. Repair by welding	15	0	0	0	37	52
16. Replace iron parts	49	0	5	0	31	85
17. Sharpen sickle, scythe or other hand tool	132	3	47	0	41	223
Farm Buildings						
1. Replace boards on buildings	130	3	4	4	6	145
2. Replace doors on buildings	56	3	5	0	4	67
3. Patch shingles on buildings	32	2	6	0	15	55
4. Replace feed boxes or mangers	45	0	6	0	2	53
5. Build or repair wood floor in building	37	3	10	0	3	53
6. Make or repair windows	57	6	5	0	3	71
7. Make or repair screens	52	17	10	5	6	90
8. Build or repair screen porch	36	1	5	1	2	45
9. Make or repair cellar or cave door	39	0	7	0	1	47
10. Build or repair wood steps	55	5	6	5	3	74
11. Make a pen for poultry	54	27	24	2	2	109
12. Make a hog trough	52	0	3	0	0	55
13. True up a door that sags or binds	44	0	5	0	3	52
14. Build a bench, table, or shelf	32	3	24	0	0	59
15. Put on tar-paper roof	34	0	5	0	12	51
Fence Building						
1. Set fence posts (iron, cement, or wood)	185	11	89	3	25	313
2. Stretch and staple on barbed wire	149	14	78	3	27	271
3. Stretch and staple on woven wire	110	5	50	0	21	186
4. Repair any kind of fence	165	7	86	3	14	275
5. Build a board fence	55	2	14	0	5	76
6. Make a swinging farm gate	44	0	13	0	5	62
7. Make a wire gate	45	0	5	0	14	64
8. Replace or build a corner brace	55	0	19	0	5	79
Harness Repair						
1. Repair leather on harness	140	0	64	0	12	216
2. Repair collar	50	0	6	0	5	61
3. Replace hame staples	67	0	13	0	3	85
4. Repair halter or bridle	106	0	35	0	10	151
5. Fasten cockeyes on tugs	65	0	19	0	5	89
6. Any riveting in leather	154	0	1	1	15	171
7. Replace any other leather on harness	100	0	42	0	6	148
8. Repair saddle	39	0	25	1	0	65
9. Make a rope halter	41	0	2	2	5	50
10. Splice a rope	69	0	7	0	0	76
Care of Trees						
1. Spraying trees	39	7	16	1	7	70
2. Pruning trees	45	7	14	1	0	67
Painting and Finishing						
1. Paint a building	54	11	17	3	6	91
2. Paint new wood	47	9	40	5	2	103
3. Stain and varnish new wood	30	17	37	2	0	86

*Chicago Normal College, Chicago, Ill.

[1]The letters in the columns refer to the following: F, father; M, mother; S, son; D, daughter; O, outsider; T, total. The figures indicate the number of times each job was performed.

Name of Job	F	M	S	D	O	T
4. Paint old furniture	30	34	29	7	0	100
5. Wax a floor	25	29	3	12	3	72
6. Remove varnish or paint	24	34	34	9	0	101
7. Varnish a floor	25	29	3	12	3	72
8. Paint a floor	18	20	3	6	0	47
9. Paint or varnish woodwork	25	52	12	19	5	113
10. Whitewash walls	18	24	2	0	1	45
11. Hang wall paper	28	47	2	14	10	101
12. Repair scratched finish	35	39	5	3	1	83
Auto Mechanics						
1. Grease the car	187	0	104	0	45	336
2. Tighten shackles	34	0	5	0	5	44
3. Adjust carburetor	152	2	106	3	22	285
4. Oil the springs	104	1	70	3	10	188
5. Adjust brakes	105	0	54	0	34	203
6. Clean squeaky brakes	50	0	7	0	5	62
7. Make temporary casing repair	108	0	34	0	5	147
8. Change tire and inflate	174	0	91	17	57	339
9. Repair inner tube	159	0	66	15	19	259
10. Drain and flush radiator	70	0	40	6	19	135
11. Repair leak in radiator	48	0	7	0	7	62
12. Clean and adjust spark plugs	110	0	50	0	45	205
13. Test and fill battery	64	0	29	3	35	131
14. Clean commutator	30	0	2	0	10	42
15. Wash and polish car	106	69	80	47	23	325
16. Drain and refill crank case	69	0	21	1	50	141
17. Grind the valves	24	0	16	0	31	71
18. Clean gas line	34	0	11	0	15	60
19. Clean the screen and carburetor	44	0	11	0	10	65
20. Replace head- and tail-light bulbs	66	0	20	2	15	103
21. Patch top or side curtain	30	7	6	2	6	51
22. Adjust and clean the clutch	54	0	21	0	10	85
23. Lubricate the rear axle	25	0	7	0	19	51
24. Remove carbon	35	0	24	0	14	73
25. Adjust needle valve in carburetor	44	0	30	2	7	83
26. Check air in all tires	204	0	121	3	30	258
27. Oil the gas engine	58	12	62	0	19	151
28. Repair the starter	23	0	3	0	34	60
Water Supply						
1. Grease the windmill	49	0	19	0	10	78
2. Grease the pump jack	34	0	10	0	3	47
3. Cut threads or assemble a piece of pipe	38	0	9	0	6	53
4. Replace leather on cylinder of pump	31	0	5	0	6	42
5. Thaw out frozen pipes	58	6	14	6	5	89
Electrical Repair						
1. Replace fuse in switch box	35	3	0	0	7	45
2. Test or replace light bulbs	40	10	0	16	0	66
3. Hook up and install a radio set	25	0	10	1	10	46
4. Test radio tubes	28	0	0	1	11	40
5. Test radio battery and replace	35	5	16	0	14	70
Heating						
1. Fire the furnace	71	40	32	19	5	167
2. Clean burners in kerosene stove	19	164	3	36	0	222
3. Clean and polish a range	0	282	1	108	43	434
4. Build fire in stove	350	331	130	180	0	991
5. Put up a stove	57	36	24	7	0	124
6. Take down a stove	38	36	20	5	5	104
7. Clean stove pipe	70	80	13	12	1	176
8. Clean the flue	32	35	1	1	5	74
9. Blacken the stovepipe	16	65	5	7	5	98
Household Repair						
1. Strengthen joints in furniture	38	11	27	7	0	83
2. Solder a kitchen utensil	29	24	3	0	8	54
3. Sharpen kitchen knives	99	266	35	95	10	505
4. Repair sewing-machine belt	20	49	3	30	1	103
5. Repair window shades	10	73	4	15	0	102
6. Oil sewing machine	5	249	6	34	0	294
7. Repair piece of furniture	48	36	31	6	4	125
8. Make a piece of furniture	11	0	37	6	2	56
9. Hang a picture	39	91	30	40	0	200
10. Reseat a chair	13	17	15	3	2	50

Name of Job	F	M	S	D	O	T
General Housework						
1. Clean wall paper	10	90	0	19	10	129
2. Clean woodwork	5	144	3	89	3	244
3. Iron clothes	6	542	25	332	33	938
4. Press clothes	10	385	42	219	25	681
5. Polish shoes	175	314	224	241	117	1071
6. Sew on buttons	10	385	18	270	7	690
7. Mend clothes	3	503	14	219	25	764
8. Darn stockings	0	478	0	241	5	724
9. Sweep walks	57	392	91	221	5	766
10. Sweep floors	28	559	76	333	38	1036
11. Polish woodwork	14	188	2	78	3	285
12. Mop floors	7	500	15	272	30	824
13. Wash windows	6	365	17	211	9	608
14. Clean silverware	10	379	10	157	15	571
15. Wash dishes	45	589	166	412	19	1233
16. Wash clothes	75	575	91	287	29	1059
17. Set the table	38	580	40	421	17	1096
18. Clean rugs	30	333	40	185	2	500
19. Beat carpet	32	239	70	116	5	462
20. Clean curtains	10	227	0	90	6	333
21. Hang curtains	15	203	0	92	2	312
22. Stretch curtains	0	203	0	92	6	301
23. Clean light fixtures	5	108	2	59	3	177
24. Clean mirrors	10	367	26	240	11	654
25. Clean kerosene or gas lamps	3	420	60	221	7	711
26. Make draperies	0	58	0	15	1	74
27. Hang draperies	5	64	0	30	0	99
28. Make an article of clothing	0	379	0	217	18	614
29. Put up window shades and curtain rods	14	125	13	75	5	232
30. Do home dry cleaning	0	141	11	52	0	214
31. Make the beds	32	517	40	305	23	917
32. Lay linoleum or carpet	25	90	7	47	3	172
33. Scour cooking utensils	23	391	42	217	6	680
34. Run a cream separator	177	115	128	54	39	513
35. Clean a sink	0	235	3	163	17	418
36. Repair shoes	29	0	23	0	37	89
Cooking						
1. Prepare breakfast	55	594	50	247	7	953
2. Prepare dinner	98	587	47	325	38	1095
3. Prepare supper	27	582	10	339	5	963
4. Peel potatoes	23	571	62	367	5	1023
5. Prepare other vegetables for cooking	35	546	34	321	7	943
6. Fry potatoes	40	545	50	324	17	986
7. Boil potatoes	37	553	20	346	10	966
8. Bake potatoes	2	355	7	225	7	596
9. Bake cake	0	530	25	277	0	832
10. Bake pie	0	551	0	238	0	789
11. Prepare and bake bread	0	511	0	173	0	684
12. Bake cookies	0	371	0	118	0	489
13. Bake pudding or other dish	0	448	0	172	0	620
14. Boil, fry, or poach egg	61	557	59	352	32	1061
15. Prepare and roast meat	3	455	0	166	0	624
16. Boil meat	54	394	0	141	0	589
17. Fry meat	54	562	52	277	16	961
18. Make noodles, dumplings, or pot pie	0	338	0	74	0	412
19. Make soup	12	403	0	187	1	603
20. Make salad	12	421	2	175	0	610
21. Can fruits or vegetables	7	312	0	96	0	415
22. Dress or cook a chicken	5	380	1	149	0	535
23. Make pickles	1	258	0	22	0	341
24. Make jam or jelly	2	258	0	61	0	321
25. Prepare or cook fish	0	148	2	65	0	213
26. Prepare cooked breakfast food	31	462	0	221	23	737
27. Make candy	0	226	75	239	0	540
28. Put up a lunch	0	306	42	250	2	600
29. Make butter	3	325	14	89	20	451
30. Make cheese	0	115	0	0	0	115
Camping						
1. Drive the car on trip	52	15	21	0	3	91
2. Follow trail markings	61	19	20	2	1	103
3. Read road maps	43	27	22	10	3	105
4. Ask for information (en route)	57	2	24	2	3	88
5. Build fire in woods	30	14	25	19	0	88

Name of Job	F	M	S	D	O	T
6. Arrange luggage	37	43	10	5	2	97
7. Plan trip	38	35	10	12	6	101
8. Drive car — observe traffic rules	180	69	62	80	15	406

Conclusions

1. Mr. Scott concludes from his data that boys in the middle west or similar farming communities would benefit by a course which contains rough carpentry, elementary cabinet work, auto mechanics, knowledge of common electrical appliances, a little plumbing, painting and finishing, some general housework and cooking, repair of harness and fences, care of trees and some masonry work.

2. The author believes that the best type of work for the rural community is a combination of home mechanics and farm mechanics.

3. The farmer does a great many of the handy-man jobs around the home and farm. The wife also does many jobs but most of her work would come under home mechanics.

4. Mr. Scott favors using the comprehensive general shop as a means of presenting the jobs of a mechanical nature and would teach the cooking and sewing in the home-economics laboratory.

Gee, But He's Great

*Allen D. Backus**

SOME months ago a manual-training teacher in a town near by applied to me for a position. He submitted plenty of references and proofs of ability and looked like a good bet, but there were other applicants for the position, and a choice was difficult.

While still undecided I dropped in one night for a game of bridge with some friends who lived in the town in which the applicant taught. Roger, aged 12, the young hopeful of the family, knowing where my interests lay, insisted on showing me the boat he had just finished in his manual-training class. It was a good job and I praised it highly. More for the sake of conversation than from curiosity, I asked Roger who his manual-training teacher was, but when he replied that it was Mr. S. I pricked up my ears, for here was an opportunity to get first-hand information regarding the man in whom I was interested. So without too great a display of interest I asked Roger how he and the rest of the boys liked Mr. S. Enthusiasm made Roger's eyes sparkle as he replied, "Gee, but he's great! Do you know him?"

A pile of "To Whom It May Concern" letters a foot high wouldn't have decided me in favor of Mr. S. as quickly as did Roger's reply. It is perhaps superfluous to say that Mr. S. got the job, and every time I go in his shop and watch him work with his classes I find myself unconsciously saying, "Gee, but he's great."

I have asked many boys the same question about their manual-training teacher, and have received a variety of replies. Sometimes the boy says without any particular enthusiasm, "Oh, he's all right," or the reply may be, "He's too strict" or, "He won't let us make anything we want to make," or even, "Oh, he's too particular, if the work isn't perfect he takes it away and makes us do it over again."

I have seen many, many rating sheets for teachers. You have seen them, too. Some are simple and brief, others cover a page or more and are infinitely detailed: skill in teaching, resourcefulness, skill in shop management, coöperation, loyalty, professional growth, personality, and so on, down the list with a rating for each item and a final score at the end. Maybe such devices are all right but I would much rather take a chance on Roger's, "Gee, but he's great!" or, "Oh, he's not so hot," or "All the kids call him old Miss S."

You may have all the education in the world, you may be a better mechanic than Henry Ford, the deportment of the boys in your shop may be something to marvel at, and the projects your boys make may take first prizes at the county fair; but if the boys themselves, behind your back, don't say you're great — why then you're not great — and that's that.

*Director of Manual Training, Newark, New Jersey.

—◎—

THE LITTLE BUILDER

*Frank B. Cooper**

I saw a child at play today;
'Twas serious play, for he builded.
In his mind stood planned, a castle grand,
And block by block he reared it.
His hands untrained, wrought not quite true,
And crumbling, the walls came down.
The work of his hands in ruin lay strewn,
But not the thought in his brain.
A moment of pain, then he strove again
At his task that was play to him.
With courage new, he carried through
The thought of his hour of play.
I turned away, but he seems to say:
Build true, oh man, to thy vision's plan,
And joy, as you work, in the things that you do.
'Tis the purpose in toil that makes it as play;
And the spirit of doing that carries it through.

*Mr. Cooper was superintendent of schools in Seattle, Washington, from 1901 to 1922. He died in December, 1930.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

BACKING THE ORGANIZATION

On the Table of Contents page, in this issue, there is an announcement of a number of conventions of industrial-arts and vocational-education associations to be held in the next few months. To make them successful will require the united efforts of everyone concerned.

Under present conditions, however, two things are likely to happen. The first is that the officers of the organizations, laboring under the necessity to keep expenses to a minimum, may set up mediocre programs in order to keep down costs. In other words, they may choose to sacrifice quality because of the present economic conditions. This, however, is a fatal mistake. If there ever was a time when industrial arts and vocational education needed champions, this is the time. The entire field of education is under scrutiny. There are many shortsighted men who think that the cost of education is entirely out of proportion. With sanctimonious sighs they refer to the good old days when boys and girls went to school under wonderful teachers who gave them a thorough grounding in the three R's at a minimum expense to the taxpayers. Unfortunately these men, because they speak of minimum costs, easily get a hearing with the taxpaying citizen. Unfortunately also, those educational administrators who have not kept abreast of modern educational thought are only too prone to lop off everything except the long-established academic courses. This step is especially easy for them because by cutting off the so-called special courses they can at once show up economies that, to the taxpayer, seem worth while.

It is up to the leaders of industrial arts and vocational education to make every effort to show the extreme need of their subjects in the curriculums of the elementary and secondary schools. It is up to them to show that both industrial arts and vocational education have long outgrown the status of special subjects; that both of these fields belong to general education as much as the other so-called standard courses. It also is their duty to reëducate, if such a thing is possible, those men in educational administrative positions, who added industrial-arts and vocational subjects to their curriculums because at the time it seemed to be the popular thing to do. Now that these subjects need champions, these men seemingly do not know just why they added them to the other subjects offered in their schools. It is these weak members in our educational structure that need strengthening, and the reënforcing, if it is done at all, must be done by the leaders in industrial arts and vocational education.

Convention programs must therefore be made exceptionally strong. There may not be any suicidal attempts at cheapening that which is offered to those who attend.

On the other hand, the members of these organizations may also decide to cut expenses by not attending. This will mean reduced income for the organization holding the convention, and in this way it will pile up a deficit which will be very difficult to eradicate. As a matter of fact, debts caused by conventions have in the past been the cause of degeneration and even death for many a promising organization. The rank and file of the members must not forget that much depends upon them. The best planned convention is a failure if the attendance is low. Each member must therefore be careful not to decide too hurriedly that he cannot afford to attend conventions this year. A little careful planning may effect economies which will make attendance possible even in the face of salary cuts. At any rate, no industrial-arts and vocational teacher can afford not to support any movement which has for its objective the stabilization and improvement of the field in which his professional activities lie.

—◎—

WILLINGNESS TO DO THE JOB

One of the duties of the teacher in the school shop is to inculcate in his students a willingness to do their share of any job that may fall to their lot. Not all of these jobs will be pleasant, and it is just human nature for the boy to demur when an unpleasant task comes his way. It is so easy for him to ask "Why should I be asked to do this job?" and it is then the teacher's duty and opportunity to point out to the questioner that his query might also be stated "Why should someone else have to do this job?"

Jobs, no matter whether they please or displease the worker, inexorably demand just one thing, and that is — to be done. The job, if we personify it, cares little about who undertakes it or who finishes it — but unless it is finished something that depends on that particular job cannot function.

Whether one person or another is chosen to do the job is merely accidental — the main thing is that the job be done.

A story which might help to make this lesson understandable to the student is told about Michelangelo. When this master of the sixteenth century was given the commission to decorate the Sistine Chapel, he might have chosen for himself only those surfaces that could be easily reached and leave the ceiling and other troublesome places for his apprentices and helpers. It is said, however, that he chose to do the ceiling himself, and for four and a half years he worked at the hundreds of human figures in that ceiling piece. During most of his working hours at this job, he had to work with face upturned and arms raised aloft. Yet he made a thing of beauty, something that has delighted millions of his fellow men.

He deliberately chose to do the hard, the disagree-

able thing. He realized that someone had to do that ceiling, and so he took that job for himself, knowing that its accomplishment might involve labor and inconvenience, but also knowing that the fulfillment of the task would bear with it the satisfaction of a victory gained over self, materials, and conditions — a victory which would amply repay him for his efforts.

When the student once learns to tackle disagreeable jobs with this viewpoint in mind, he will find that their performance becomes much easier. True, conditions will remain the same. The job and its disagreeable features will not be altered, but the one who performs the work is no longer the same. He has put himself above the job. Mean and insignificant as the piece of work may be, it has transformed its performer into a master — one who has power both over externals and over self.

Many shop teachers, too, may find this story to be applicable in their own cases. It is so easy to imagine that when an unpleasant job is suddenly thrust upon one to feel that the principal or the supervisor is doing it only to humiliate one. In the majority of cases this will not be the truth at all. The job is merely given to the shop teacher because he seems the most logical person to do it, and the main thing is to have it done. The teacher who has accustomed himself to look at such a job then as an opportunity rather than as an unpleasant task, has made its performance easier for himself, and its accomplishment another indication of his willingness to coöperate.

—◎—

COLUMBUS DAY

October twelfth is set aside to commemorate the discovery of America, and to honor its discoverer, the great Italian, Christopher Columbus. This illustrious man, upon whom the goddess Fortuna alternately smiled and frowned, possesses many qualities that ought to endear him to every industrial-arts and vocational-education teacher.

For years he nurtured a definite plan. Disappointment after disappointment awaited him as he applied first at the court of Portugal, then in succession at those of Spain, England, France, and finally again at the court of Spain.

He had much to do to fight down the prejudice which the learned built up against him. To them he was one of those "who do not speak our language," and hence they looked upon him as a man whose opinion and knowledge was not worth much. He was belittled as a dreamer, as a plain fool, and as a presumptuous upstart. At length, when driven almost to the point of despair, he meets friends who take an interest in him and his story. Finally he succeeds in convincing them of his knowledge and superior worth, and it is due to their efforts and influence at court that Spain's king and queen are finally persuaded to furnish the wherewithal that made it possible for him to test out the value of his convictions.

One can picture the scene on that morning of August 3, 1492, when he, his officers, and his comparatively small crew solemnly march down from the church where they have attended Mass, to embark on the three small vessels which were to carry them on their eventful quest. In the crowd of curious onlookers who had gathered to see them start, there were many who predicted failure. To them, the idea of the entire undertaking seemed the figment of a disordered imagination.

Then came the voyage, when for days and days, he and his companions go on and on, hoping and hoping, driven ever onward by their belief in the soundness of their leader's plan. When hope had been prolonged almost to the point of despair, land is sighted, and the dreamer, who had once been scoffed at, becomes one of the most illustrious men of Spain.

His subsequent alternate periods of success and failure, his return in disgrace to the country that he had made renowned, do not detract from his greatness. Through all of these vicissitudes, and though he is much troubled with ill health, he is ever an honest, straightforward, characterful man who is modest in success and dignified under adversities and unmerited disgrace.

What a fine model for the youth of today. What a wonderful example to be placed before the students of industrial arts and vocational education. Columbus demonstrates so thoroughly that the practically trained man may not only be skilled in his trade but may also possess a keen mind. He showed his better-educated contemporaries that the brains of the country were not entirely confined to the group that followed intellectual pursuits. He demonstrated to them that men who followed the common everyday pursuits of life were able to make logical deductions from premises that were gathered from diverse sources, and that they also were capable of arriving at far-reaching and definite decisions based upon these deductions. He had to fight the opinions of the same group that today want to fill the school shop with those students who do not do well in academic work, with the mistaken notion that brains are not necessary where manual skills are involved. The present-day academically trained, just as those of Columbus's day, seem to forget that manual skills are of little use unless they are applied in a definite way, and that the brain which determines their application, must be just as capable as those that plan professional procedures.

—◎—

NEED FOR SPECIALIZATION

The trend of the times is so rapid that a man cannot be efficient in every line. Branches of training must be taught that will fit boys for the specialized work of industry. It is important that workers be trained as specialists in different trades. Each worker must choose his line and endeavor to train himself thoroughly in that line. All men should receive training along the line of their own special fitness. — *E. J. Sunderland.*

Patternmaking in the Junior-High-School Curriculum

*Frank C. Cech**

IT HAS been suggested that a foundry unit be added to the general-metal-shop program. This unit would introduce the student to the making of castings from such nonferrous metals as brass, white metal, and kindred alloys. As it is illogical to have a foundry unit without having some semblance of pattern work connected with it, the necessity arises to decide what branch of patternmaking to choose as a concomitant course. Surely in such a large field as patternmaking presents, there must be some type or branch that will fit well into the general-metal-shop program.

Patternmaking as a vocation has been called an art, a profession, and some other names not quite complimentary. It has been little understood by the layman, and has often been confused with the cutting of patterns in the clothing business, or the making of templates in other lines of endeavor. Little has been said or taught concerning patternmaking in the schools until the tenth or eleventh grade of the senior high school. There are certain reasons for this. It is a trade that is closely allied with other trades, and consequently cannot be taught individually.

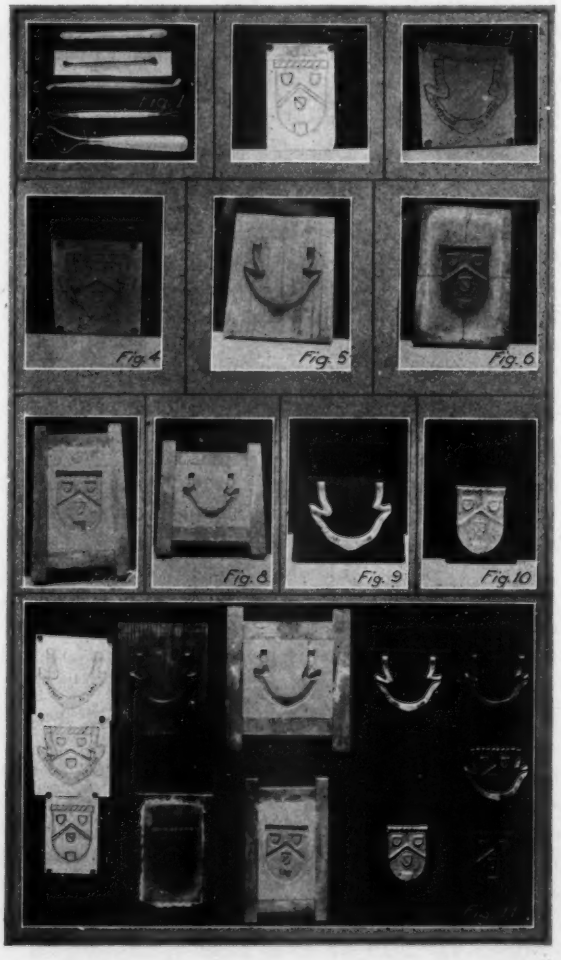
Patterns are a means to an end. The end being a finished casting. The routing of a finished casting in production is via the blue print, pattern, mold, core, the pouring of the metal, the cleaning of the casting, machining, and assembling. The patternmaker must be able to interpret blue prints and visualize from them something that is to be constructed and which, for the time being, exists in imagination only.

The pattern work proper may be divided into three major divisions. The first is *wood*, the second is *metal*, and the third is *plaster*.

As the most common pattern material is wood, it is necessary that a patternmaker working in this branch, be versed thoroughly in woodwork. Woodwork is ordinarily divided into the following trades, namely, carpenter and cabinetmaker. The cabinetmaker's trade is subdivided into (*a*) machine hand, (*b*) wood turner, (*c*) bench hand. The patternmaker is a combination of all of these plus the knowledge of the methods employed in the foundry, core room, machine shop, and in some cases the assembling of the parts. Expectations would be rather high, to anticipate the assimilation of all this material even in its elementary stages by the junior-high pupils. For this article suffice it to say that wood patternmaking is not the medium for the junior-high-school-shop pattern work.

Metal patternmaking consists of filing, scraping, machining, and the foundry preparation of pattern castings. Wood, plaster, and wax patternmaking are the basic trades necessary to produce the pattern castings. Consequently, we may strike the metal pattern work, temporarily at least from our junior-high curriculum.

The plaster division of patternmaking is the one then that remains for consideration. It is subdivided into plaster, wax, and clay modeling, and plaster, and glue or gelatine molding. Of the former, clay as a modeling material is the most appropriate for the use of the junior high school, especially as it helps to establish some kind of correlation between the academic and the industrial-arts subjects. From the kindergarten and up through the grades, modeling clay has been used to good advantage, hence it may well be used as



*Patternmaking Instructor, Cleveland Trade School, Cleveland, Ohio.

a medium of correlation between the academic subjects and the industrial-arts subjects in the pattern and foundry unit.

Let us see to what extent this correlation may be carried. A boy, entering a general shop, is confronted with the choice of a project and decides that he wishes to make a door knocker. The instructor finds that the boy's home is of the so-called English type, and suggests that the design of the door knocker should be in keeping with the home.

The boy is sent to look for an appropriate design. He must delve into books and catalogs. In so doing, he is using the knowledge gained in his English and history courses to good advantage. On scouting for a design he finds that something which suggests Shakespeare, Dickens, etc., would be typically English. A shield such as was customarily used for a coat of arms is decided on as the base casting. A flowing ribbon with the words, "Stratford on Avon" inscribed on it, is to be the knocker. He must then apply the knowledge gained in his art classes in sketching the design, and the clay-modeling experience to furnish the model.

Since a clay model cannot be used as a pattern in making a sand mold, it becomes necessary to cast a plaster mold from the model, and a plaster or wax pattern must in turn be cast from the plaster mold. This calls for the establishment of a plaster casting unit, with suitable equipment and the required materials for the general-shop program.

A sand mold is made from the pattern and a bronze casting is obtained. Two castings are necessary for a door knocker. They must be fitted and fastened together by rivets or screws. This necessitates the performance of general-metal-shop operations, and may include sawing, chipping, filing, drilling, tapping, polishing with abrasive cloth, and buffing. The final operation may be lacquering, or the door knocker may be exposed to the weather for a natural finish produced by the tarnishing of the metal. Either method may be used with satisfactory results.

Thus we see definite correlation between subjects which might otherwise never be noticed. The greatest value lies in the fact that the pupil himself can see a close dovetailing of one subject into the other.

Typical Information and Operation Sheets

Modeling Clay
Information

The art of modeling in clay may be safd to antedate the use of plaster. It was known and used as far back as any records of civilization are obtainable. The popular use of clay modeling, like that of plaster, has alternately gained and lost in favor. It is an art that deals with the building up or the creating of forms or models. In this it is the reverse process of sculptoring, which deals with the reduction of a more or less hard substance, by the use of sharp tools to a form, design, or model.

The modeling material that is used may be plaster, wax, or clay. Clay is the more acceptable material for school use. It is an earthy substance, which when damp, is plastic, and may be molded or modeled into shape.

The common modeling clay must be kept moist to be workable. When work is discontinued on an unfinished model, it is covered with a damp cloth. The cloth is kept damp by spraying with water from time to time. This is to prevent the clay from drying out and cracking. Oil, vaseline, and other similar substances, have been substituted for water to keep clays indefinitely moist and plastic. There are a number of prepared clays on the market that may be used continuously without fearing that exposure to air or water may affect them. These clays are ideal for use in the schools.

Wherever possible the fingers and hands should be used for modeling. They are the best modeling tools, but as they have their limitations, auxiliary tools are used. Some of these tools are made of wood, such as boxwood, pear, or apple, and are of various shapes and sizes, with either plain or serrated edges (see A and C, Fig. 1). These tools are also made of metal (see B, Fig. 1), and others are made of wire that is bent to different shapes and sizes. The wire portion of the latter tools are fastened to wood handles as is shown at D and E, Figure 1.

Operation Sheet

Objective: To habituate the necessary steps involved in the building up of a clay model.

Tools: The necessary modeling tools as to shape and size, dividers, calipers, and rule.

Material: Modeling clay as required.

Procedure:

Note: In making the model prior to making a plaster mold from it, refer constantly to the illustration so as to get the proper proportions and shape. Stand back from the model occasionally, so as to get a better view from the diffierent angles.

1. Procure a picture, sample or illustration of the article to be modeled. If this is impossible, make a sketch to work from. Figures 2, 3, and 4 show sketches made of the door knocker, the first two showing the details of the base casting and knocker, and the last showing the assembly.

2. Select a piece of wood or other material to serve as a mount for the model. It should have a true and smooth surface, and be large enough for the plaster frame to set on. Figures 5 and 6 show the model mounted on board. The center lines may be seen running vertically and horizontally.

3. Give the surface of this board two or three coats of shellac.

4. Draw vertical and horizontal center lines on the mounting board.

5. Sketch the outline of the model using calipers, dividers, or other suitable tool to make sure that the sketch is laid out symmetrically about the center lines.

6. Start building the model by pressing firmly, with the fingers or hand, small bits of clay to the board over the sketch.

7. Add enough clay to get the desired depth of the model.

8. Shape the model roughly with the fingers.

9. Using a wire tool that corresponds to the shape and size of the part of the model that is being worked on, remove the excess clay, thereby roughing-in the shape of the model.

10. Choose a wooden tool with an end that is of a shape that corresponds to the part of the model being worked on.

11. The tool is used in a stroking or slicking manner, producing a smooth surface. Care should be used to see that a slight taper or draft is provided on the model. Although a cast may be made from a clay model that is underdraft, it results in added work later, by necessitating the provision of draft in the plaster mold. When the model is as desired, it is ready to be cast.

Preparing the Model for Casting
Information-Operation Sheet

Greasing Compounds

There are a number of materials available for oiling or greasing a model or mold to prevent the plaster casts from sticking to them.

Soap solution — Soap that is dissolved in boiling water to a creamy consistency is often used.

Grease — Common grease, if reduced with kerosene or benzine until it is of the consistency of cream, is satisfactory if nothing else is at hand.

Stearic acid — This is the best material for school use. It can be bought in a powder or cake form. The preparation is as follows:

1. If the cake form is used it should be shredded.
2. Place the powder or shreds in a receptacle.
3. The receptacle is then placed in a container filled with boiling water; a glue-pot water jacket is ideal for this operation.
4. When melted, add five parts of kerosene or benzine to 1 part of melted stearic acid. Stir thoroughly, then allow to cool. It is now ready for use.

Objective: To learn to prepare a model for casting.

Procedure:

1. Build a frame of clay, wood, or other material about the model. This serves as a retaining wall for the plaster.
2. Fill any openings that may exist with clay to prevent the loss of plaster by a run-out.
3. Grease the model with a fine brush that has been dipped into the greasing compound. An even film should cover the model, therefore:

a) Be sure to get the grease into all the crevices.

b) Remove all *lumps* of oiling compound formed, from the mold. The mold is now ready for pouring.

Plaster of Paris
Information Sheet

Gypsum, either in the form of rock, seed, or earth, is used in many industries; plaster of paris is the most important form used. Practically all of the many grades of calcined gypsum are classed as different forms of plaster. Its value as a commercial commodity has been known from the time of the Egyptians. Gypsum is very widely distributed. There are many uses for plaster of paris. One of them is in dentistry — for taking impressions and making casts. Another is in modeling — for taking casts of original work where it is desired to make a reproduction in either metal or other material.

Plaster today is used not only in works of architecture, art, and the medical profession, but also in the world of mechanics. In pattern work of light cross section it is customary to make a wax or clay model from which a plaster mold is cast. A master pattern of plaster or wax is made from this mold and is later reproduced in metal. This casting is finished by filing, scraping, and abrasive cloth polishing, and assumes the rôle of a metal pattern.

In gauging or mixing plaster the hands should always be used wherever possible, as this enables one to feel and crush any lumps that may have formed in the water. Many plasterworkers disagree as to the best methods of handling plaster. No definite rules can be established, and an observing practical experience is necessary.

Use "fresh" plaster, that is, plaster that has not been exposed to air, thereby given a chance to absorb moisture, resulting in "dead" or "killed" plaster (a term given to plaster which does not set as quickly nor as hard as it should). A test for plaster is to squeeze a small amount in the hand, if it will cohere, it is suitable for use. Select the proper grade of plaster for the work at hand. In ordering state the size of work for which it is to be used.

For mixing plaster, a shallow rather than deep enameled receptacle with a spout should be used. It should be kept clean at all times. Use only clean cold water for mixing plaster. The consistency of plaster varies and is governed by the size of the job, and whether there is a large amount of sharp detail work. Detail work always requires thinner plaster. The average should be of a creamy consistency. When stirring plaster:

a) Do *not* add more water as this tends to weaken the plaster.

b) Do not add plaster as this creates additional heat, causing swelling and warping.

Plaster that is gauged thin is weak, and of a soft texture, and consequently is easily broken. Water forming on top of the mold is a sign of poorly gauged plaster.

Plaster of Paris
Operation Sheet

Objective: To learn to gauge or mix plaster.

Tools: A receptacle large enough to hold the amount of plaster needed; a large spoon or paddle to stir the plaster.

Materials: Plaster of paris as needed; clean cold water.

Procedure:

1. Estimate the amount of plaster that will be necessary to fill the mold.
2. Pour water into the receptacle until an amount equal to three fourths that of the required plaster has been reached.
3. (*a*) Take an amount of plaster on a paddle or spoon, or (*b*) use one or both hands to dip out the plaster.
4. Carry the plaster directly over the surface of the water.
5. (*a*) Shake the spoon or paddle so that the vibration will cause a small amount of plaster to fall into the water, or (*b*) sprinkle the plaster over the water with the hand.

Note: Care should be used to move the paddle, spoon, or hand over the whole of the surface of the water while sprinkling the plaster into it. This will fill the receptacle evenly with plaster. Do *not* stir the mass while adding the plaster to the water.

6. Repeat operations 3, 4, and 5 until dry plaster shows through the top of the water. This shows that enough plaster has been added.
7. Stir the plaster thoroughly. The harder it is stirred and beaten, the harder it will set. The plaster is now ready for pouring.

Pouring the Plaster and Removing the Model
Operation Sheet

Note: If the plaster is poured into a wood frame, nails should be driven into the sides to reinforce the mold and prevent the plaster from dropping out of the frame.

Procedure:

1. Pour the plaster into the mold slowly and steadily so that the plaster rolls over the model from one end of the mold to the other.
2. Jolt or bump the mold to insure plaster of an even texture. This expels any air bubbles or "blebs" which may have formed during the pouring of the mold.
3. Allow the plaster to set slightly and remove the excess plaster by striking off the surface with a straightedge until even with the rim of the mold. The plaster is now allowed to set until warm, which is an indication that it is ready to have the model removed. The time necessary to set plaster will vary with the weather conditions, kind of plaster, and the size of the cast. Generally a period of 20 to 25 minutes is sufficient.

When removing the model or cast,

1. Turn the mold upper side down.
2. Rap gently on all sides to ease the model.
3. Remove the model by drawing it from the mold evenly.
4. When removing a plaster cast instead of a model, if the mold can be easily handled, grasp the mold and knock all four corners consecutively on the bench. This will release the cast and cause it to fall out.

Preparing the Mold Prior to Pouring the Cast

The mold must now be wiped free of all grease. It must be thoroughly inspected to see that sufficient draft is provided. A knife may be used to provide draft and to remove any imperfections. If any air bubbles have formed small holes, a quantity of plaster may be mixed and dripped into them. One or two coats of shellac are applied and after drying, the mold is greased. See Figures 7 and 8 for a picture of the plaster mold of door knocker.

Reinforcing the Cast .

If the cast is thin, reinforce it with galvanized wire, reed, bamboo splints, strips of cloth, or string. This reinforcing material is used for thin casts to prevent them from breaking in the process of removal or handling. The amount and kind of reinforcing necessary will be determined by experience. For example, a cast ⅛ in. thick, 1 in. wide, and 4 in. long, should be reinforced with one or two pieces of No. 22 or No. 30 wire or its equivalent.

1. Prepare the plaster for the pattern.
2. Pour the mold and allow to set.
3. If any reinforcing is used it may now be added to the mold.
4. Remove the cast from the mold.
5. Wipe free of grease, and apply two or three coats of shellac.
6. If any holes exist in the cast, they may be waxed up as in other pattern work. Should the cast crack, it may be shellacked together.
7. The pattern is now ready for the foundry. Figures 9 and 10 show the finished patterns of the door knocker. Figure 11 shows the sketches — models, molds, patterns and castings with the assembled door knocker.

Concrete Problems from Homemade Forms

*William L. Hunter**

THE difficult part of a concrete course is usually in the making of the forms. Many times a boy has to spend at least three fourths of his time in the making of some form, only to find when the course is finished that he has learned little about the actual mixing, pouring, and curing of concrete. The writer has tried the plan of having each class make one form which is somewhat permanent and which is kept for use by succeeding classes. In this way but a small fraction of the time of a course is required for form making and much can be learned about the actual processes of concrete making.

In the making of concrete forms, when any degree of permanency is desired it is almost necessary that metal be used as a material against which to cast the concrete. Of course, wood may be used in case the form is such that it can be removed soon after the concrete is tamped into place, but anyone who uses a metal form soon comes to realize the superiority of metal over wood. The problems described in that which follows, have all been cast against galvanized iron, although in the case of one of the lawn benches equally satisfactory results would be obtained from a wooden form.

Figure 1 shows a pair of garden steps made from the form illustrated in Figure 2. The steps are 3 in. thick and 8 in. at the widest part of the foot by 18 in. long. The concrete mixture, rather dry, may be tamped firmly into place, and the form removed immediately for the making of additional feet. By reversing the form, both left and right feet may be made. A large piece of galvanized iron is placed on the floor on which to do the casting. Two-inch material is used on which to tack the galvanized iron. The iron is allowed to project on each side of the wood about ½ in. This permits the top of the foot to be troweled rather easily. Of course, many other shapes of garden steps may be made, but these seem to make an unusual appeal to the garden owner.

Figure 3 shows a foot scraper which is welcome in almost any garden. The concrete block is 4 by 10 by 11½ in. and is cast in the form shown in Figure 4. The form is made in halves with dowel rods to align the two parts. The wooden part of the form is lined with 22-gauge galvanized iron made in halves and fitted loosely inside the wooden parts of the form. The iron part of the foot scraper is made of band iron. The foot scraper is set in a hole in the ground near the garden gate. This is all it needs to be held securely in place.

Figure 5 shows a lawn bench which is quite attractive and one which can easily be made in the industrial-arts shop. The size of the concrete slab is 3 by 18 by 54 in. Three ½-in. reinforcing rods run the length of the slab. The concrete is cast with either a wooden form made of 2 by 3-in. stock, or the wooden form may be lined with galvanized iron if greater permanency is desired. The slab is cast on a sheet of galvanized iron and the forms are removed soon after the concrete is tamped into place. The edges of the slab and the top are troweled so as to produce a

*Head of Industrial-Arts Department, Iowa State College, Ames, Iowa.

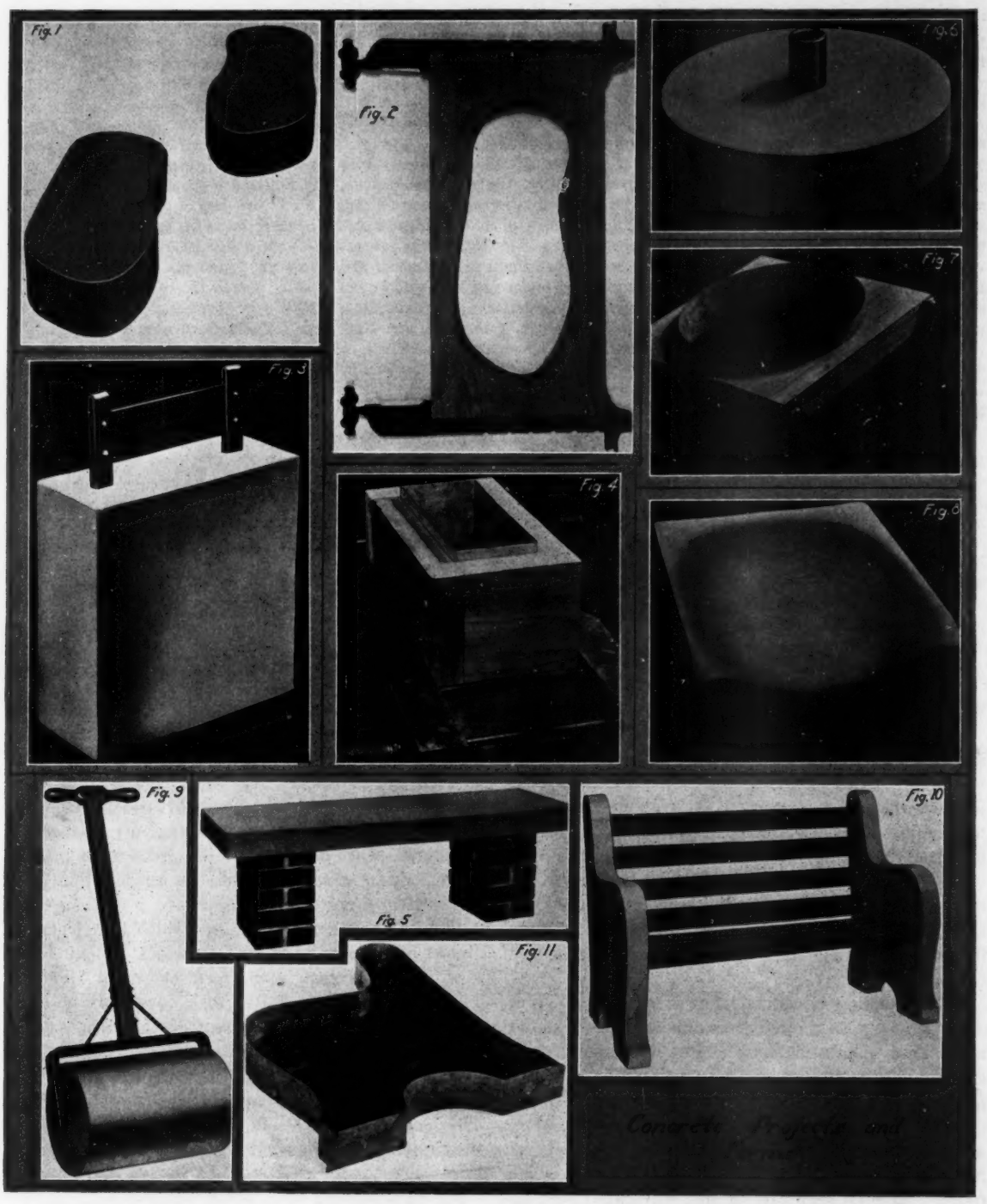


FIG. 1. GARDEN STEPS
FIG. 2. FORM FOR GARDEN STEPS
FIG. 3. FOOT SCRAPER
FIG. 4. FORM FOR FOOT SCRAPER
FIG. 5. LAWN BENCH
FIG. 6. CHRISTMAS TREE STAND
FIG. 7. FORM FOR CHRISTMAS TREE STAND
FIG. 8. DOWN-SPOUT ROLLER
FIG. 9. LAWN ROLLER
FIG. 10. LAWN BENCH
FIG. 11. FORM FOR LAWN BENCH END

smooth surface. The upper arrises of the slab are rounded slightly with the trowel. The legs are made of brick, one brick wide and a brick and a half from front to back, by five bricks high. After the legs have set for two or three days, they should be washed off with a 50–50 mixture of muriatic acid and water. This cleans off any mortar stains which the inexperienced boy may have got on the face of the bricks.

Figure 6 shows a Christmas-tree stand which was made from the form shown in Figure 7. The stand is 3 in. high and 12 in. in diameter. A piece of 1¼-in. pipe, 5 in. long is cast in the center of the stand into

which the tree is placed when the stand is put into use. A piece of felt or other cloth may be glued on the bottom of the stand to prevent it from marring the floors.

Figure 8 illustrates a down-spout drain, 3 by 12 by 16 in. The form is made similar to that for the lawn bench shown in Figure 5. A strike or templet may be cut out so as to secure uniformity in the upper surface of the drain. A small trowel can be used effectively for smoothing the curved surface.

In Figure 9 is shown a lawn or garden roller which is useful to the home owner during the spring of each year. The roller part is made of 22-gauge galvanized iron. The seam is locked on the inside so as to present a smooth outside surface. The roller is 14 in. in diameter and 20 in. long. The roll is kept in shape while the concrete is poured by a piece of plywood out of which a circular hole, the diameter of the roll, has been cut. This piece of plywood is raised from time to time as the concrete is tamped into place. A ½-in. rod is cast through the center of the roll to act as an axle. A piece of channel iron 2 by 1 by 3/16 by 42 in. is bent U-shaped and holes are bored in the ends of the channel iron to fit over the ends of the axle. Washers are placed on the axle between the concrete and the channel iron. The handle is then fastened to this channel iron.

The lawn bench illustrated in Figure 10 was made from the form shown in Figure 11. This bench is really comfortable and is mighty inviting to a home owner after the day's work is done. The form is not so easy to make as the others which have been described, but if a machine shop is available no difficulty should be encountered. The ends of the bench are 3 in. thick by 23 in. front to back at the widest part by 34 in. high. The back of the form is made of cast iron ½ in. thick. To the edges of the cast-iron back, 3½ in. strips of 20-gauge galvanized iron are fastened with machine screws. The tapered lugs are also fastened to the back with machine screws. The pins which fit loosely in the lugs are for the purpose of providing holes in the concrete ends through which round-headed wood screws are placed for holding the ends to the wooden slats of the bench. The ends of the slats are tapered so as to fit into the recesses in the concrete ends made by the lugs. Needless to say, both right- and left-hand forms are needed for this bench. A much simpler form may be made for this bench out of 2-in. plank, but the wooden form is not very durable and is subject to much shrinkage and warpage. If a wooden form is used it should be coated with a 50–50 mixture of paraffin and kerosene.

References

Adams, Frederick A. and Chase, Chester E., "Possibilities of Cement in Manual Training," *Industrial Arts Magazine,* March, 1920, page 111.

Baxter, Leon H., "Cement and the Boys," *Industrial Arts Magazine,* May, 1924, page 193.

Gerber, H. P., "Ornamental Concrete," *Industrial Arts Magazine,* August, 1926, page 288; October, 1926, page 372.

Gerber, H. P., "Ornamental Concrete Bird Bath," *Industrial Arts Magazine,* May, 1927, page 185.

Haas, Louis J., "Cement Work as a Therapeutic Occupation for Men," *Industrial Arts Magazine,* October, 1922, page 384; November, 1922, page 434; December, 1922, page 473; January, 1923, page 15; March, 1923, page 114.

Hunter, William L., "Ornamental Concrete," *Industrial Arts and Vocational Education Magazine,* June, 1931, page 225.

McKenney, Richard E., "Cement Casting," *Industrial Education Magazine,* November, 1927.

Watkins, R. E., "Making Concrete Surfaces More Attractive," *Industrial Arts Magazine,* February, 1922, page 60.

Yager, Sylvan A., "Cement and Concrete Work for Junior or Senior High Schools," *Industrial Arts and Vocational Education Magazine,* June, 1931, page 197.

PEN AND INK RENDERING, ARCHITECTURAL-DRAFTING CLASS, ABRAHAM LINCOLN HIGH SCHOOL, COUNCIL BLUFFS, IOWA.
R. M. HAMMES, INSTRUCTOR

PROBLEMS & PROJECTS

FREE-HAND, THIRD-ANGLE PROJECTION FOR BEGINNERS IN MECHANICAL DRAWING

Jonathan Bright, Academy High School, Erie, Pennsylvania

(Continued from September, See Supplement No. 255)

Problem Sheet No. 11

Choice of views. This sheet was intended to test the pupil's initiative and to make him think and use the information he should have acquired by this time. Very little help is to be given the student by the instructor. The boy is expected to choose and draw only those views which he considers absolutely necessary. The instructor's chief duty will be to assist in clearing up points which may not be clear to the student.

Problem Sheets No. 12 and 13

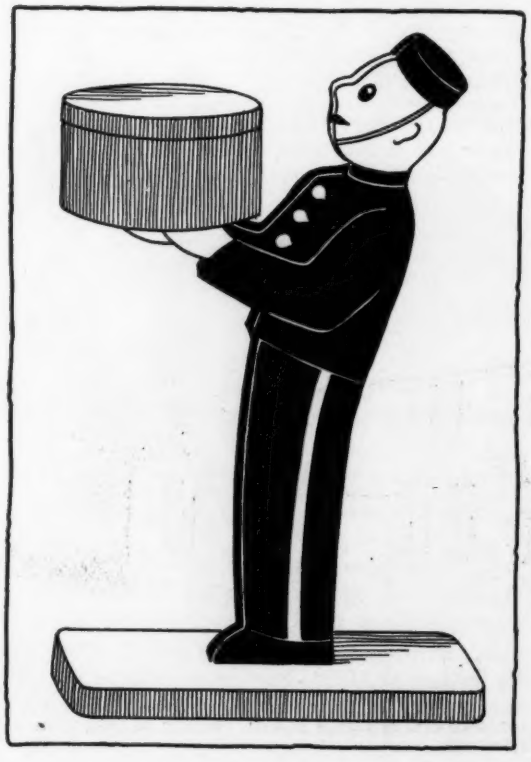
Dimensioning. These two sheets cover the subject of dimensioning thoroughly. Most of the methods of dimensioning commonly used are taught by the use of these problems. Faber's *Treatise on Dimensioning*[1] explains and illustrates the various rules for dimensioning and will be found to be valuable as a reference. If desired, these sketches may be saved and used later as problems to teach the use of the drawing instruments. Choice of views is left to the student and teacher.

A PLEASING NOVELTY

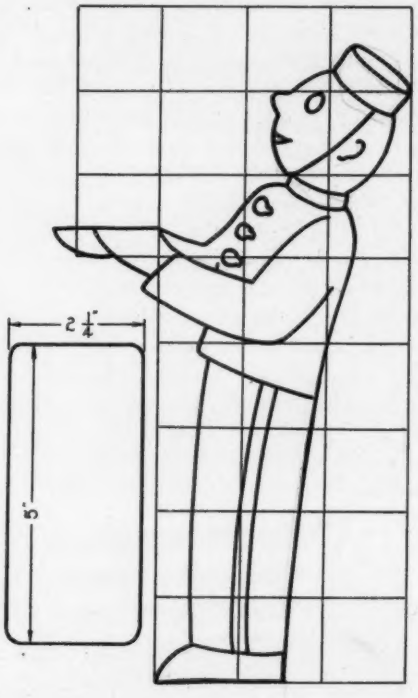
Hazel F. Showalter, Davenport, Nebraska

The little bell boy holding a box for a boy's collar buttons or for a girl's rings and jewelry is a pleasing novelty and makes a good shop project.

[1]The Bruce Publishing Co., Milwaukee, Wis.



To make the pattern, draw a rectangle 4 in. wide by 8 in. high and mark it into inch squares. Then the lines of the pattern can easily be drawn in the squares. Half-inch wood is suitable for both the shaped piece and the base. A ready-made box which costs only a dime may be fastened to the bell boy's hands, or a little tray or a square box may be constructed of thin wood.



The little bell boy will look very smart in a suit of black or very dark blue with a stripe, buttons, and lines in gilt, especially if he carries a gilt band box and stands on a gilt block to match.

UPHOLSTERED STOOL

Leslie H. Murphy, Princeton, Kansas

The upholstered stool described herewith may be made of walnut. Figure 1 shows its construction. There is a rabbet cut all around the top of the stool for tacking the upholstering. Figure 1 also shows the layout for the turned leg.

The first step in the upholstering is to put on the webbing, as shown in Figure 2. The next step is putting on the springs. Six-inch pillow springs are used. They are arranged on the webbing, as shown in Figure 3. The next step is tying down the springs with twine. After the springs are tied, a piece of burlap is tacked over them, and 2½ lb. of moss is placed on top of it. This should be put on evenly so that there are no low places. Next stretch a piece of burlap over the moss and tack it in place with 4-oz. tacks. Then place a thin layer of cotton over the burlap, and over this stretch a piece of muslin and tack it into place. It is advisable at this time to put on the finish so as to keep the varnish off the cover.

The cover may be either tapestry or velour. It should be

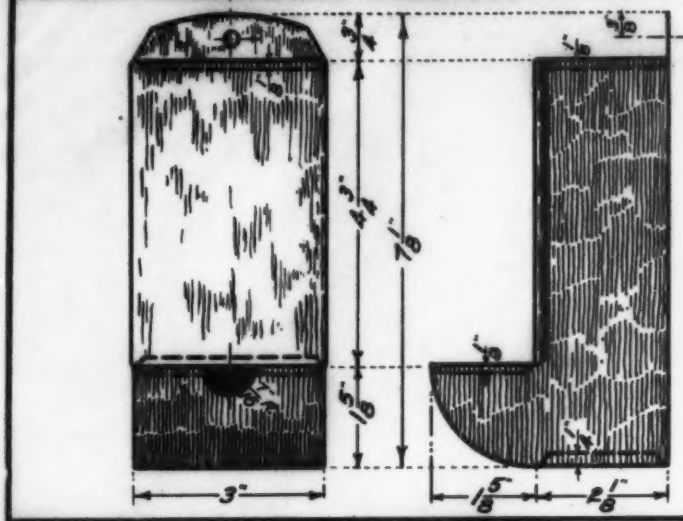
Periodicals

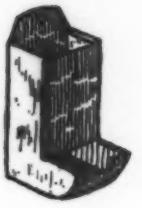
To be Reproduced for School Shop Use Only
Copyright, 1932, The Bruce Publishing Company

MATCH BOX

Ele. Sheetmetal Work

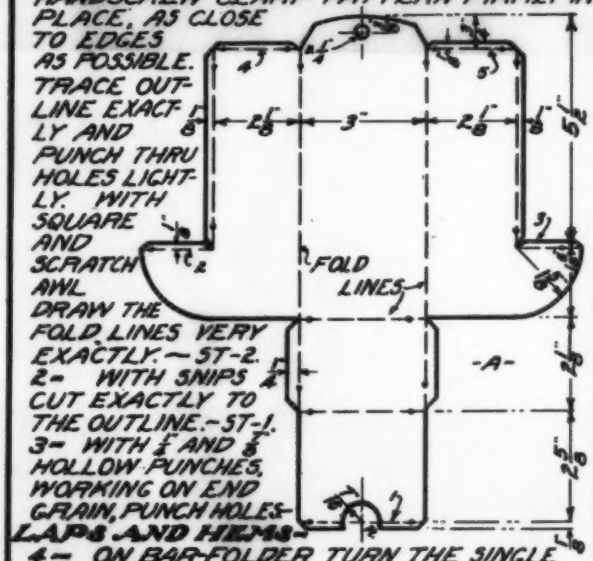
PROJECT SHEET E-5





SOLDER AVOIDS DIRT

PATTERNS — 1- OBTAIN THE SMALLEST PIECES OF TIN PLATE POSSIBLE. WITH HANDSCREW CLAMP PATTERN FIRMLY IN PLACE, AS CLOSE TO EDGES AS POSSIBLE. TRACE OUTLINE EXACTLY AND PUNCH THRU HOLES LIGHTLY. WITH SQUARE AND SCRATCH AWL DRAW THE FOLD LINES VERY EXACTLY. — ST-2.



2- WITH SNIPS CUT EXACTLY TO THE OUTLINE. - ST-1.

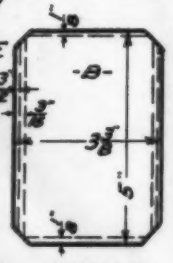
3- WITH 1/4" AND 1/8" HOLLOW PUNCHES, WORKING ON END GRAIN, PUNCH HOLES.

LAPS AND HEMS -

4- ON BAR-FOLDER TURN THE SINGLE HEM ON EDGE -1-. 5-1.

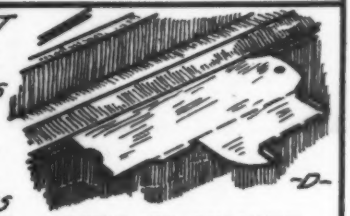
5- THE SINGLE HEMS ON EDGES 2, 3, 4 AND 5 ARE MADE BY HAND ON THE SQUARE STAKE WITH A MALLET.

6- PLACE MATERIAL IN THE BRAKE AS SHOWN AT -D-. FOLD THE SIDES UP SQUARE, EXACTLY ON LINES. — ST-8.



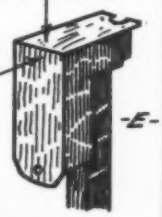
7- FOLD BOTTOM WITH FINGERS, KEEPING LAPS INSIDE THE SIDES. WITH MALLET MAKE FOLD SQUARE AS SHOWN AT -E-. STRIKE AS INDICATED BY ARROWS. —

8- WITH MALLET AND WORKING ON SQUARE STAKE, BEND EDGES X AND Y (SEE -C-) AT RIGHT ANGLES TO THE SIDES, BUT DO NOT CLOSE THEM DOWN. —



TURN UP SQUARE IN THE BRAKE

9- COAT LAPS AND INSIDE LOWER EDGES OF THE SIDES WITH SOLDER. PLACE WORK, AS SHOWN AT -F-, ON A BLOCK OF WOOD. HOLD COPPER ON LAP UNTIL SOLDER RUNS LIKE WATER. KEEP STEADY UNTIL COOL. —



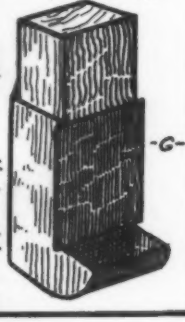
10- WITH FINGERS BEND BOTTOM TO FIT THE CURVE OF THE SIDES. KEEP IT JUST INSIDE. SOLDER. HOLD JOB SO SOLDER CAN RUN DOWN TO IT. NOW SOLDER THE SAME EDGES ON THE INSIDE, ALLOWING SOLDER TO RUN LIKE WATER FORMING A CLEAN ROUND CORNER. — 5-4.

11- CUT THE FRONT. SEE -B-.

12- ON BAR-FOLDER FOLD THE 1/8" SINGLE HEM ON TOP AND BOTTOM EDGES. — 5-1.

13- ON BAR-FOLDER FOLD A 3/16" LOCK ON THE SIDE EDGES. THESE ARE TURNED THREE QUARTERS OVER BUT NOT CLOSED. — 5-5.

14- SLIP FRONT IN ITS PLACE, AS SHOWN AT -G-, WITH THE HARD MAPLE BLOCK INSIDE. WITH SETTING HAMMER PEEN THE LOCKS DOWN TIGHT. WITH MALLET AND A SCREWDRIVER BEND PARTLY OVER. WITH MALLET CLOSE DOUBLE SEAM DOWN TIGHT. - 5-5.



15- WITH A FILE CLEAN UP ALL ROUGH PLACES. —

16- ENAMEL. —

F-8

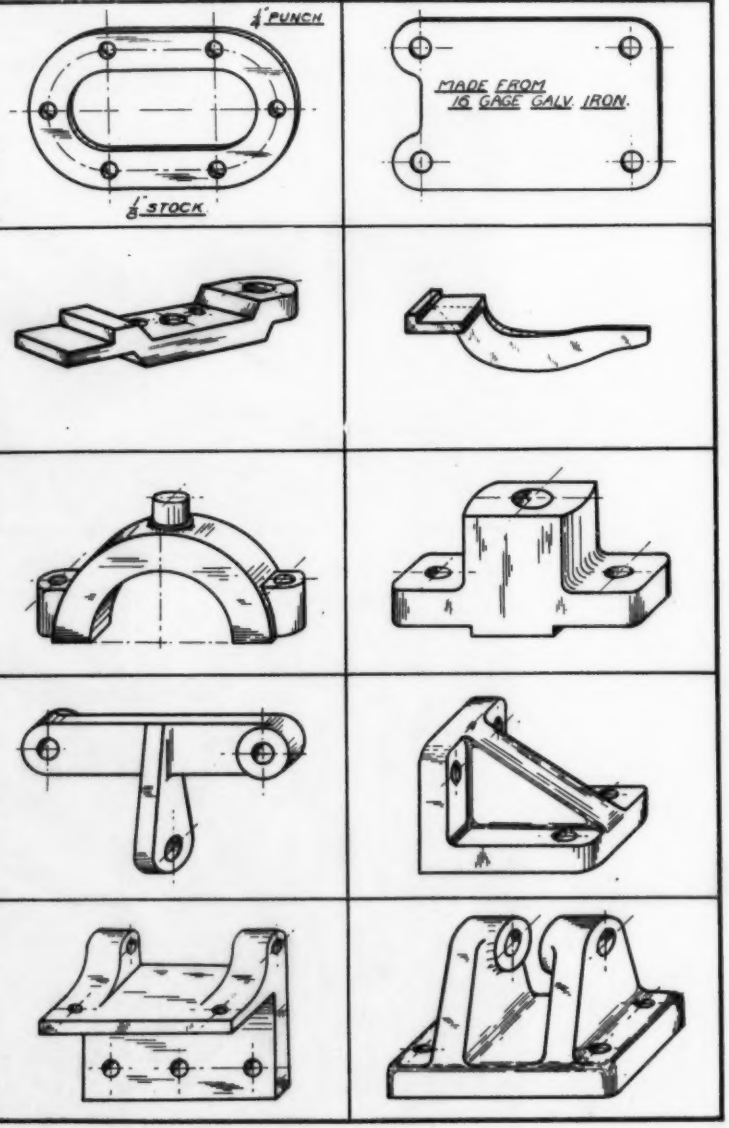
Designed by Clifford B. Smith, Buffalo, N. Y.

TRACING SUPPLEMENT No. 255, NOVEMBER, 1932
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

To be Reproduced for School Shop Use Only
Copyright, 1932, The Bruce Publishing Company

FREEHAND SKETCHING.

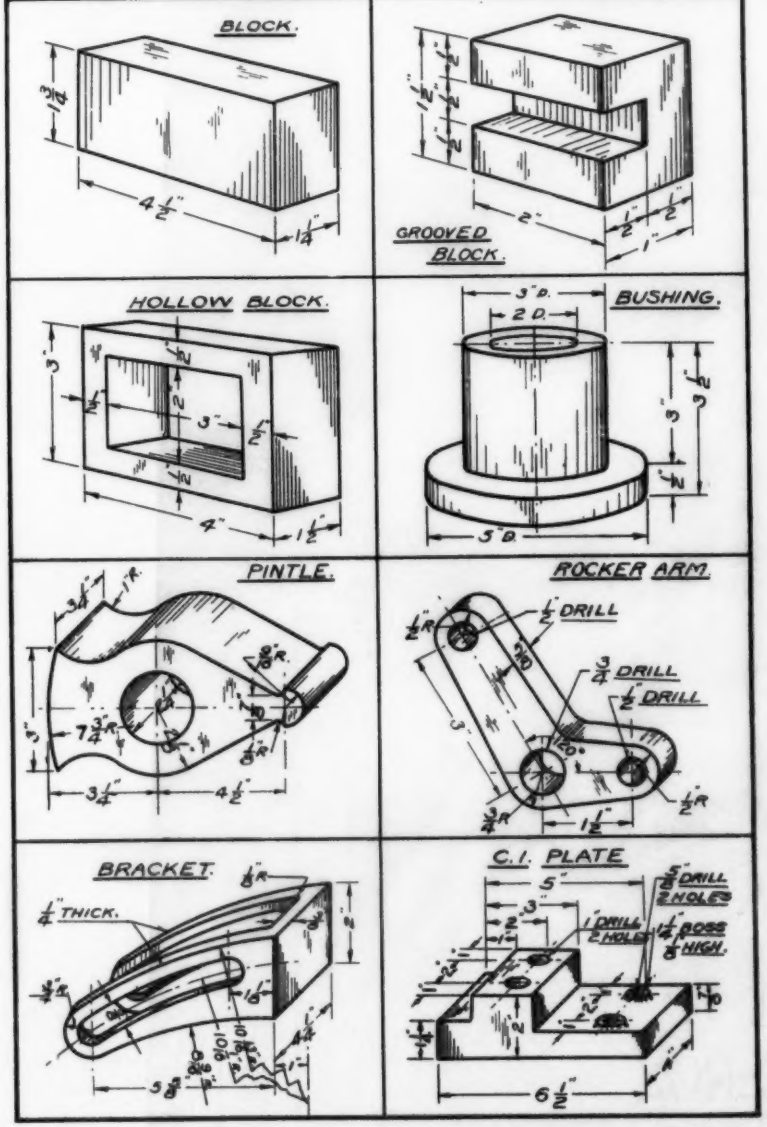
CHOICE OF VIEWS. No 11.



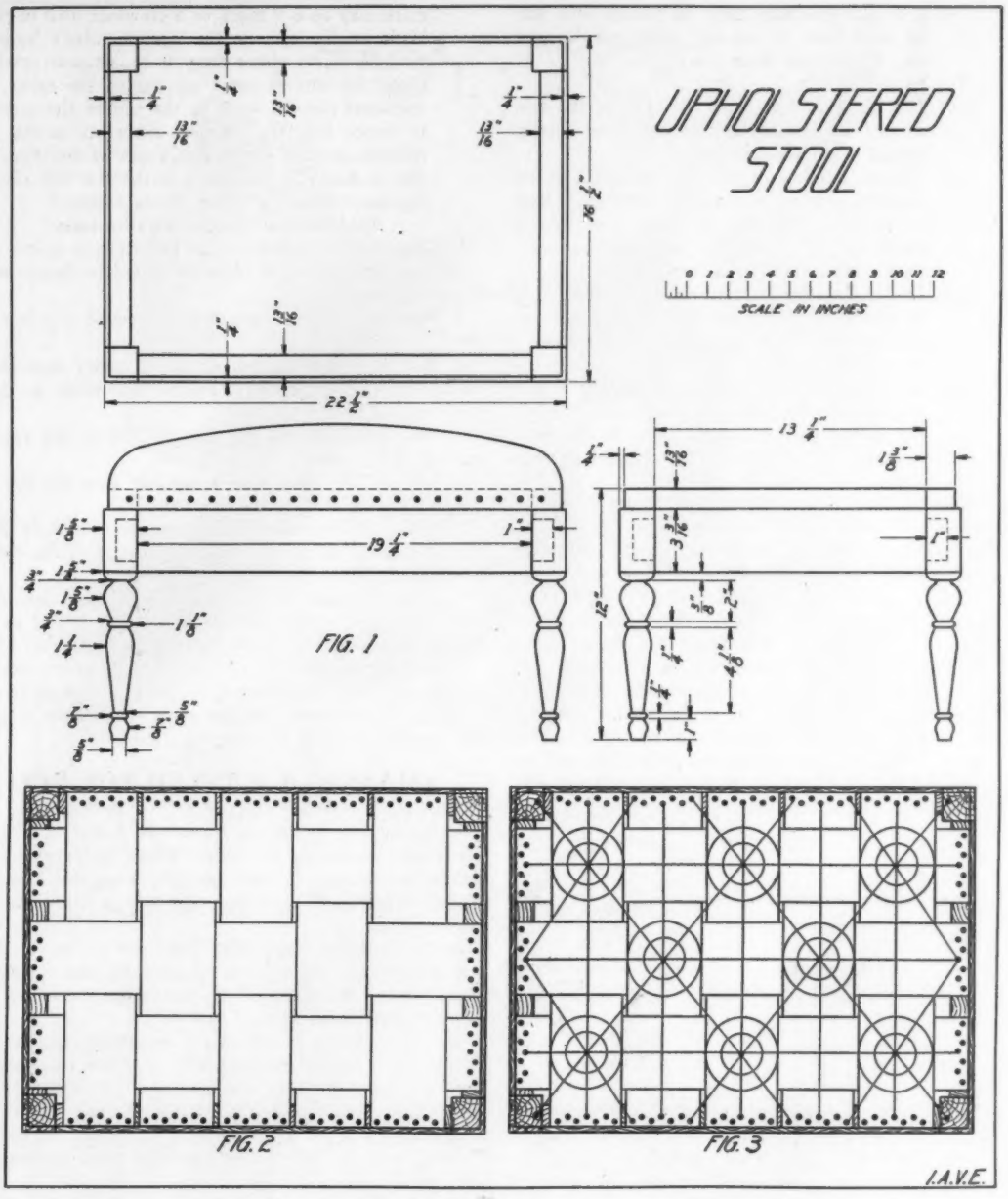
Submitted by Jonathan Bright, Erie, Pa.

FREEHAND SKETCHING.

DIMENSIONING. No 12.



Described Elsewhere in This Issue



stretched lightly and tacked with 2½-oz. tacks. To make the stool look finished, tack a piece of gimp around the stool to cover the tacks. The webbing may be hidden by tacking a piece of black denim over the bottom of the stool.

CIRCULAR SAWS, THEIR CHARACTERISTICS AND USE—II

John E. Doren, Supervisor of Industrial Education, Eureka, California

(Continued from October)

When a saw is run at full speed, the metal at the rim expands, and, if the saw has been properly hammered it will flatten out, be stiff at the rim, cut straight, and run true without excessive vibration. If the hammering has not been sufficient or properly done, the saw will be "loose" at the rim when run at full speed; it will dodge out of line in a cut and produce faulty work. If the hammering has been carried too far, the metal at the rim will not expand sufficiently to permit the saw to flatten out; it will still be convex on one side, but the saw will be stiff at the rim. If the amount of clearance provided in the teeth is sufficient to prevent the work from rubbing on the convex side of the saw, such a saw will do fair work but the stress at the rim will be very great and the saw may crack when in use.

Hollow-ground and thin groover saws must be hammered with great care, for they must absolutely flatten out when run at full speed; if they are the least bit convex on one side, they will, because of the small amount of clearance provided in such saws, force the work out of line of the cut desired, and produce faulty work.

2. The Test for Stiffness at the Rim

a) Conditions that must obtain:

(1) Saws must be sharp and in first-class cutting condition.

(2) The lumber used in the testing must be well seasoned or otherwise representative of the material normally cut; it should be flat on one side and true on one edge.

(3) The test specimen must be placed with the flat face down on the saw table and the true edge against the guide fence.

b) The test:

(1) The test specimen should be fed to the saw as fast as the regular material is fed under normal working conditions.

(2) The test specimen after being ripped must be perfectly parallel from end to end. A saw that is "loose" at the rim will make a snaky cut which will not be parallel with the true edge. Only a stiff saw will cut straight.

(3) The test specimen after being crosscut must be perfectly true on the end; the crosscut saw must not dodge or depart in any way from a true straight line.

(4) Material cut with a hollow-ground or a thin groover saw must be so smooth and true on the sawed edges and ends as to be ready to receive glue for glue joints without further work.

C. Saws must be *round*. The periphery of the saws must be concentric with the center of rotation.

1. *Jointing*. Saws that are hand filed should always be jointed while running at full speed, before each filing. A piece of coarse-grit, medium-hard, or a soft carborundum stone will serve well for this purpose. Every tooth of a jointed saw will do its full share of the cutting. If saws are not round, the teeth farthest from the center will do the bulk of the cutting while those opposite will do little or none of the cutting, depending upon how much the saw is out of round. A saw that is round will cut readily, and little effort will be needed to feed the work to the saw. A round saw will cut faster than one even slightly out of round.

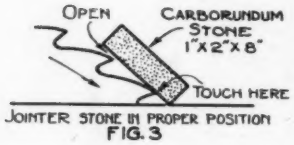


FIG. 3

FIG. 4

The stone should be held against the saw as shown in Figure 3, so that it may not catch in a tooth of even a large-tooth ripsaw. Every tooth should be touched; a "shiner" or bright spot at the tip of every tooth indicates that the saw is round. The filing must be done carefully to avoid making any of the teeth short.

2. *Mounting*. Saws, to give the most efficient service must always be placed on the arbor in the same relative position as when they were jointed; namely, with the witness mark on the top of the arbor. This witness mark may be a V mark or a crowfoot filed in the saw blade at the eye, or the manufacturer's trade-mark may serve; in either case, it is common practice to place the witness mark on top of the arbor. Some operators place a mark on the end of the arbor also, to insure that the saw and arbor are in the proper relative position every time a saw is mounted. When this is done, the periphery of the saw will always be concentric with the arbor. Study Figure 4.

Questions for Thought and Discussion

1. Why should the circular-saw blade run in a true plane?
2. When should a saw blade be tested to determine if it is running true?
3. How may a saw be tested to determine if it is running true?
4. Why is a piece of lumber crayon better than chalk or blackboard crayon for marking the saw blade in the test for trueness?
5. Why should a circular saw be stiff at the rim when running at full speed?
6. Suppose the saw is loose at the rim. How will this condition become evident to the operator?
7. Why is it important that a circular saw blade shall be round; namely, all points equally distant from the center of revolution?
8. How is it possible to mount a circular saw and be reasonably certain that it will be round, that is, that all points will be equally distant from the center of rotation?
9. Suppose that the eye of a saw is 1/32 of an inch larger in diameter than the arbor upon which it is mounted. How is it possible to mount the saw every time in the same relative position as when the saw was "jointed"?

MAKING A JOINTED TOY DOG

F. Clarke Hughes, Spokane, Washington

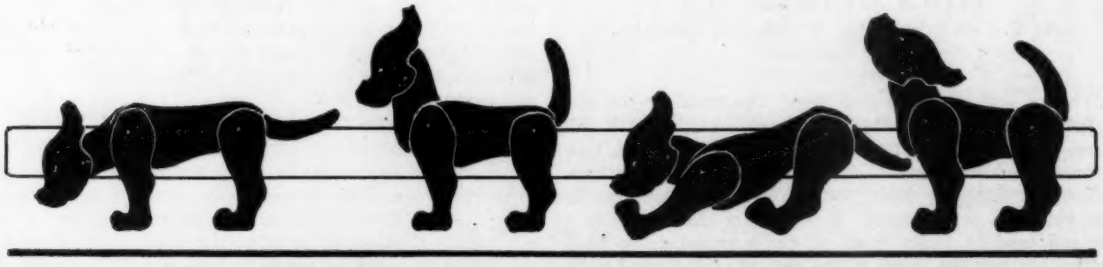
A toy dog such as the one shown and described in this article is both interesting and novel. Animal toys always interest children of all ages. If these toys are those that may be animated or moved in some way they have a double attraction for the child.

In this case the dog neither barks nor walks but may be placed in almost any one of the positions that could be assumed by the real animal. Even grown-ups spend much time in playing with this finished toy.

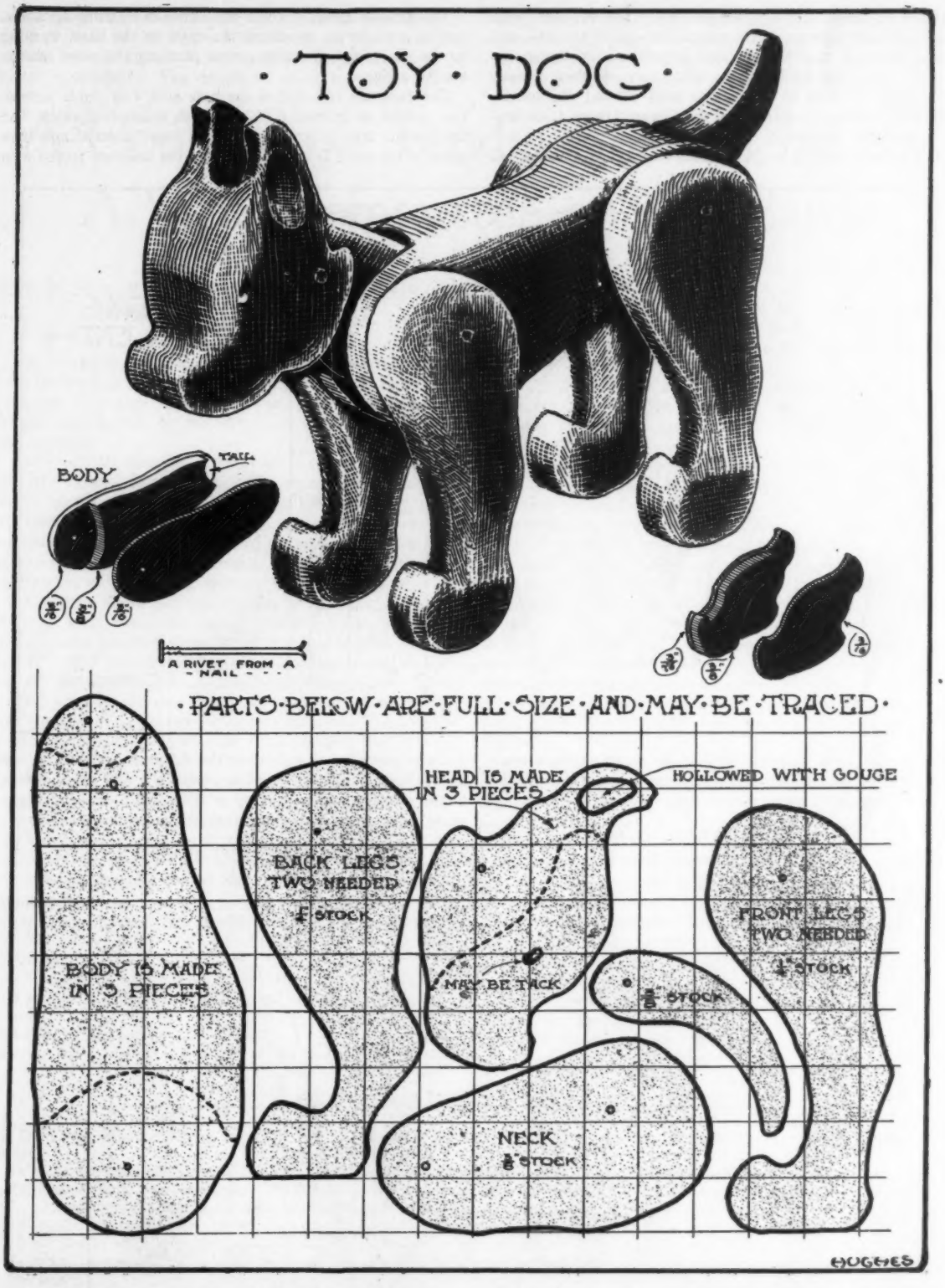
The construction of this dog is so simple that very little instruction is needed for the reader in addition to the dimensions and detail sketches accompanying this article. It is suggested that these patterns be cut out of heavy paper or thin cardboard, to be used for marking the forms on the wood. Patterns made in this way may be filed away and used again and again.

The wood used for the parts of the dog should be white pine, basswood, or any of the light, soft woods that shape easily. The different thicknesses needed for the several parts are shown in the detail drawings.

It will be noticed that the body and head are each made up of three pieces or sections, although in the set of patterns



JUST · A · FEW · OF · THE · MANY · NATURAL · POSITIONS · OF · THE · DOG



only a single drawing is shown in each case. The dotted lines serve to mark the outlines of the other parts and the small perspective sketches show the plan of assembly.

Shaping the parts may be done with an ordinary coping saw or on the band saw. When the sawing is done the parts should be rounded by using a knife or wood rasp to blunt the corners. Sandpaper will give the final smoothing to both edges and surface.

The holes for the rivets or pivots should be drilled at the points shown in the patterns. The size of the holes should be about 1/16 in. or about the size of a 6d box nail.

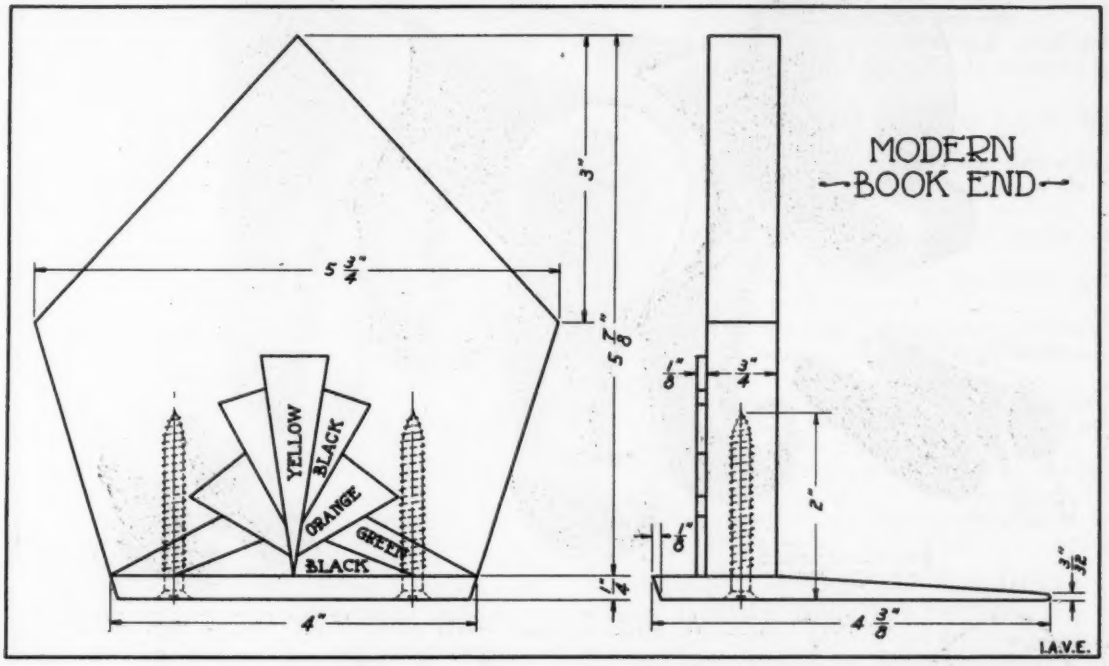
The rivets for holding the legs and other parts in place may

be made by cutting a nail so that it is about 1/8 in. longer than the combined thickness of the parts. The end of the nail, opposite the head, may be split with a hack saw or coping saw and the two parts divided like a cotter key. Another method of keeping the rivet in place is to wind the cut end of the nail with thread, the small head thus formed being then covered with glue or shellac.

The painting should be done before the parts are assembled permanently. It is suggested that at least two or three coats of dark gray or some other dull-colored brushing lacquer be used in finishing this toy.

This project gave the pupil experience in squaring up stock, putting on a bevel, mounting the ends on the base, working up the design for the ends and in planning the color scheme for the design.

The ends are fastened to the base with 2-in. f.h.b. screws. Use walnut or gumwood if a varnish finish is desired. The decorations may be cut out of thin wood, colored and then glued to the ends. It is suggested that the lines are scored with a sharp-pointed tool separating the different parts of the design. This will aid the pupil in coloring it and also helps to accentuate the different parts of the design. Yellow, black, orange, and green makes an interesting color combination.



MODERN BOOK ENDS

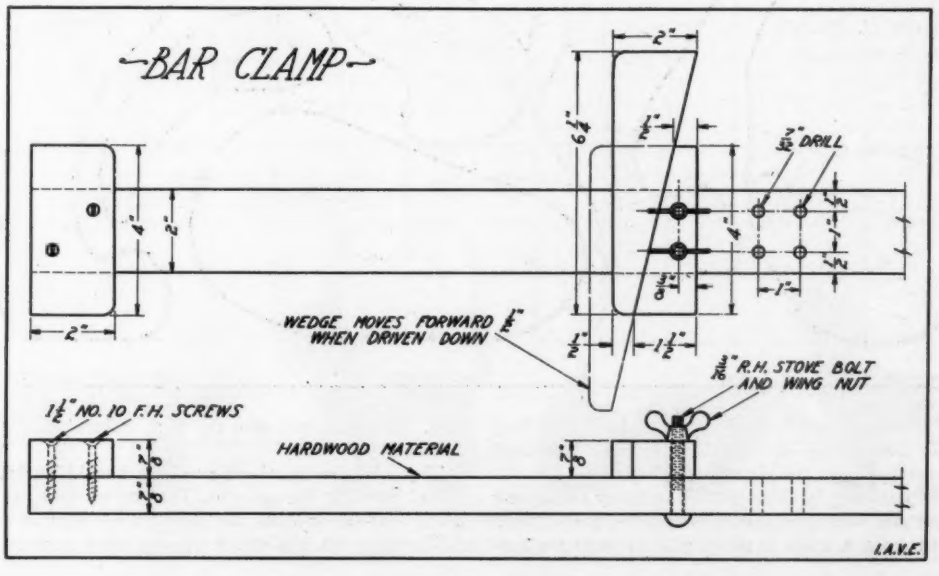
Ira C. Madden, Detroit, Michigan

New interest can be created by giving commonplace problems a modern touch. The book end described herewith shows one of modern design produced by a student in my shop.

AN IMPROVISED BAR CLAMP

Rex Aton, Oak Park High School, Chicago, Illinois

Having worked at one time in a school shop where finances did not permit the writer to have as many bar clamps as were



actually needed, caused the bar clamp shown herewith to be devised. It is by no means as handy or as efficient as the regular bar clamp, but it serves quite adequately where no better is available. The details of construction are shown clearly in the illustration. The clamps may be made of any desired length, hence, this dimension is not specified, nor are the total number of holes indicated. These two items will have to be decided upon by the maker of the clamps.

A Coöperative Study Fostered by the A.V.A. Committee on Standards

PART IX—A TENTATIVE ANALYSIS OF GENERAL METAL WORK

R. W. Selvidge*

The complete plan for this Coöperative Analysis was set forth in detail on page 189 of the May 1931 issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. A summary of the plan also appears on page 100 of the March 1932 issue of this Magazine.

Many schools provide a group of experiences under the title of "General Metal Work." The manipulative processes consist mainly of work with hand tools used in cutting, shaping, forming, and joining thin metals or metals which may be manipulated cold. In some cases castings are made with molten metal; but this involves so many hazards, it is doubtful whether the values derived warrant the risks involved.

While there is no particular virtue in confining the experience to work with metal, except that it reduces the variety of equipment required, there is no reason why it should not be done if the experiences contribute adequately to the ends desired. Metal work has not been as popular as other kinds of shopwork because the manipulation of metal is difficult and the range of experiences somewhat restricted. The average citizen cannot use metal with the same freedom that he uses other materials.

Undoubtedly the experiences to be had in general metal work may be presented so as to contribute largely to the objectives set up, which have been stated as follows:

1. To develop in each pupil an active interest in industrial life and in the methods of production found in industry.
2. How to select, care for, and use properly the things we buy.
3. The appreciation of good workmanship and good design.
4. Attitude of pride or interest in one's ability to do useful things.
5. To develop a feeling of self-reliance and confidence in one's ability to care for oneself in an unusual situation.
6. The habit of an orderly method of procedure in the performance of any task.
7. A knowledge and understanding of mechanical drawing, and the interpretation of the conventions of drawings and working diagrams, and the ability to express one's ideas by means of a drawing.
8. The development of elementary skills in the use of the more common tools and machines, and in modifying and handling materials in order to make them conform to our needs.

The learning units in the list which follows include some elementary skills and a knowledge of materials which are of general value, but by far the greatest values lie in the methods of presentation and the interpretation of the experiences provided. In arranging the situations in which they are to be presented, we must keep the following questions constantly in mind: To which of the objectives do these experiences, as presented, contribute, and in what way do they contribute? If there is not a definite and specific contribution to one or more of the objectives, our methods of presentation should be modified, or our effort to provide the experience abandoned. We cannot afford to give our time to experiences which do not make some worthy and specific contribution to our objectives, and we should know what these contributions are.

Many of the learning units in the following list are found in other groups of metal-working units, such as sheet-metal work, art-metal work, machine shop, and forging. We simply take out of the field of metal work the more elementary experiences which we believe can be used to greatest advantage, under school conditions, in attaining our objectives.

It is not necessary that all of these experiences be given. The method of giving them is the most important factor. It is not our purpose in the industrial arts to develop a large number of specific skills. The teacher should choose from the units listed the experiences which appear to him to be most valuable to the boys and which can be given most advantageously under the circumstances. He should then choose jobs which will involve the things selected. These jobs should then be presented in such a way as to contribute directly to the objectives set up.

*University of Missouri, Columbia, Missouri.

The Learning or Teaching Units

The Things the Student Should Be Able to Do:

1. To make out a bill of material.
2. To check material when received.
3. To plan your procedure in doing a job.
4. To transfer patterns to sheet metal.
5. To use tinners' snips in cutting metal.
6. To solder tin, copper, brass, and galvanized iron.
7. To sweat a joint.
8. To light and operate a blowtorch or gas furnace.
9. To use the squaring shears.
10. To form by hand.
11. To use a bar folder.
12. To turn edges for a hem.
13. To fold a curved edge.
14. To rivet joints.
15. To punch holes with solid punch.
16. To punch holes with hollow punch.
17. To raise or bump sheet-metal forms.
18. To roll a sheet on forming machine.
19. To wire edges on wiring machine.
20. To wire edges with bar folder and hammer.
21. To turn a lock seam.
22. To groove with hand groover.
23. To use a burring machine.
24. To make a setting-down seam on a machine.
25. To double seam at bottom.
26. To use the square stake in forming.
27. To use the hatchet stake in forming.
28. To drill holes in metal.
29. To use a cold chisel.
30. To stretch metal, for flange or joint, with a hammer.
31. To use a hand swage.
32. To braze with hard solder.
33. To prepare cut-acid flux.
34. To anneal copper or brass.
35. To give hammer finish to copper, brass, or iron.
36. To apply lacquer finish.
37. To color copper or brass.
38. To etch on copper or brass.
39. To clean copper with acid.
40. To tin a soldering copper.

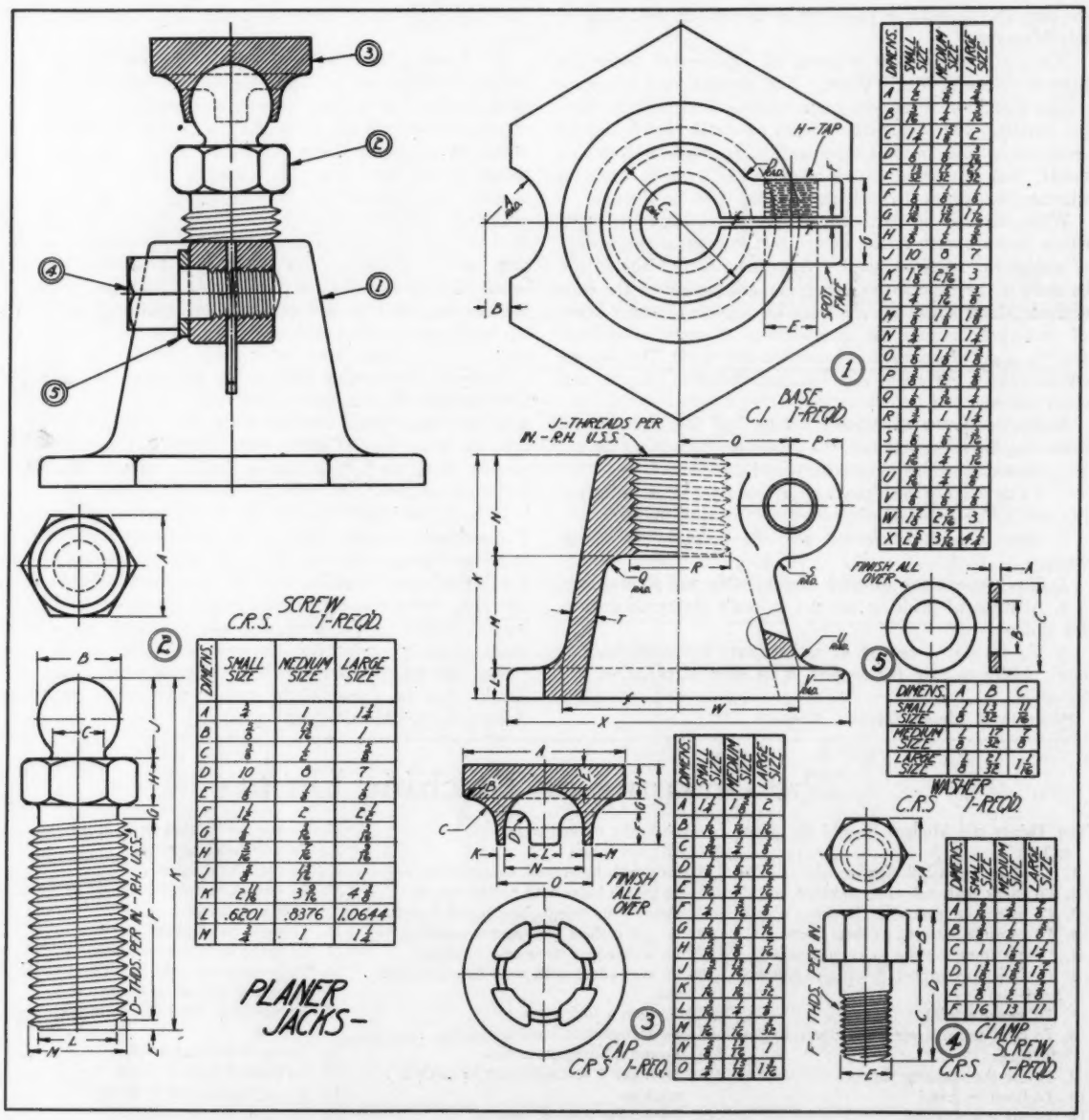
41. To use the hack saw.
42. To use the file.
43. To use taps and dies.
44. To bend, twist, and form wire.
45. To bend, twist and form strap iron.
46. To develop patterns for right cylindrical objects.
47. To develop patterns for objects rectangular in section.
48. To develop patterns for conical objects.
49. To lay out patterns for scrolls and irregular shapes.
50. To bend bars or strap iron into scrolls or irregular shapes.
51. To drill with power drill.
52. To twist iron bars, for ornamental effect.
53. To give a durable black finish.
54. To use a die to cut threads.
55. To use a tap for tapping holes.
56. To draw out hot metal.
57. To anneal steel.
58. To temper small tools.

The Things the Student Should Know:

1. The kinds of solder and their uses.
2. The kinds of fluxes and dipping solutions and their uses.
3. The names of tools, equipment, and operations in sheet-metal shop.
4. How to care for tools and equipment.
5. How to identify the various kinds of sheet metal.
6. The gauges of sheet metal.
7. Standard sizes of soft-iron wire.
8. Source and characteristics of tin.
9. Methods of manufacturing tin plate.
10. Commercial sizes of tin plate.
11. How galvanized iron is made, grades, and qualities.
12. Commercial sizes of galvanized-iron sheets.
13. Sources, uses, and characteristics of copper.
14. Composition of brass, its characteristics and uses.
15. Sources, characteristics, and uses of aluminum.
16. Sources, characteristics, and uses of zinc.
17. The principal kinds of steel.
18. How steel is made.
19. Kinds and sizes of drills.
20. Kinds and sizes of rivets.
21. How to specify grades of tin plate and galvanized iron.
22. Occupational information, including the success factors, wages, and opportunities in the industry.

What the Student Should Be:

This list of attitudes and habits which contribute to the success of individuals in any vocation, was given on page 191 in the May, 1931, issue of this magazine, and need not be repeated here.

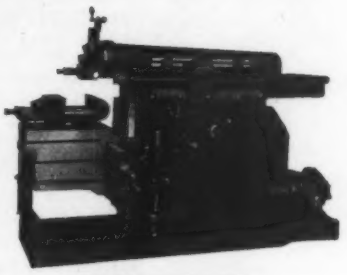


PLANER JACKS, SUBMITTED BY H. E. TODD, SUPERVISOR MANUAL TRAINING, HARRISBURG, PA.

Why Schools Should Use These Shapers

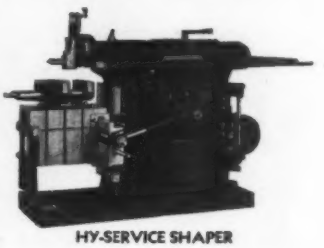
ROCKFORD HY-DRAULIC SHAPER—The use of hydraulic drives in machine tools is growing—*and it will increase more rapidly in the future.* The students of today are the shop executives of tomorrow — *and they must be familiar with the advantages and possibilities of the machines for which they will be responsible.* How can you train them for these responsibilities unless you have one or more tools equipped with hydraulic drives?

Every school machine shop ought to have at least one Rockford Hy-Draulic Shaper as soon as funds can be secured for its purchase. This machine has two applications of hydraulic power; one to the ram, the other to the table for feeds and rapid traverses. It probably represents the greatest advancement ever made in shaper design, construction and operation, and it gives the user even greater proportionate benefits than he receives from the use of hydraulic power in other machine-tools. The reasons for this are detailed in a circular that will be sent postpaid on request.



HY-DRAULIC SHAPER

ROCKFORD HY-SERVICE SHAPER—Mechanical-drive shapers will continue to be used in commercial service and in schools. In this type of machine the Rockford Hy-Service Shaper continues among the leaders. It is especially suited to school work because it is so simple in design and so easy to operate. It has everything necessary for complete, thoroughly practical instruction without costly, seldom used conveniences. It is a high-grade commercial machine which sells at a remarkably low price.



HY-SERVICE SHAPER

Write today for complete data on these shapers.

ROCKFORD MACHINE TOOL CO.

. . . . LATHES SHAPERS . . SHAPER-PLANERS

ROCKFORD, ILLINOIS, U. S. A.

JOHNSON
No. 118 Bench Furnace

For Every Shop Use

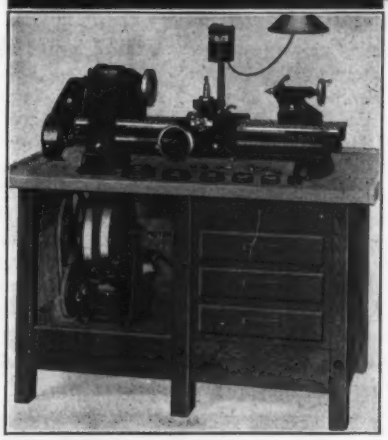
In shops all over the country you'll find the Johnson No. 118 a popular, useful tool.

Melts metals, heats soldering coppers, long rods, etc., and is very useful for heat-treating small parts. Operates efficiently without a blower.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Eastern Representatives:
R. M. Henshaw & Co., 250 Stuart St., Boston, Mass.
Steinmetz & Co., Inc., 220 So. 16th St., Philadelphia
30 Church St., New York

NEW 8" Swing Bench Lathe with Underneath Belt Motor Drive $153 Without Bench



8" x 24" Junior Underneath Belt Motor Drive Bench Lathe with 1 phase, A. C. 110 Volt Start-Stop Reversing Motor complete as shown less bench $153.00. Price of bench $34.00 extra.

The New Underneath Belt Motor Drive is entirely new, low in price and practical in operation. The entire machine is enclosed, has no overhead obstructions and provides light and freedom of vision when doing fine precision work.

Recommended for the Junior High School, Senior High School, General Shop Laboratory and Machine Shop.

Features

Lathe is back geared screw cutting type which cuts threads 4 to 96 per inch, has power longitudinal screw feeds from .0208" to .0053", hollow steel spindle, tailstock set over for turning taper and many others. Furnished in longer bed lengths up to 48".

Send for General Catalog No. 93

showing complete details of this NEW Lathe, also describing and pricing 96 other sizes and types. Over two hundred illustrations. Mailed postpaid, without obligation.

South Bend Lathe Works

134 East Madison Street South Bend, Indiana, U. S. A.

Lathe Builders for 25 Years—Over 55,000 Users

Now, Are There Any Questions?

CONDITIONING BIRCH BARK

964. Q.: Can you give me some information (or where to get it) on the handling of birch bark? I have quite a large amount of it, both dry and green. I want to know how to get it in condition so that I can use it, and how to keep it that way. — *V.M.A.*

A.: The best way to handle this birch bark would be to dampen it either by dipping or steaming so as to make it quite pliable and then clamp it between dry and freshly planed basswood or whitewood boards. In this manner it may be left until required with the assurance that it will stay flat and in good condition, provided, further, that it is stored in a cool and not too dry place.— *Ralph G. Waring.*

ANTIQUE FINISH FOR MAPLE

966. Q.: I have a solid-maple colonial bed which I have made. I have looked at various finishes and have decided upon the new antique finishes which are being shown. The new antique finish is a light, dull rust color. I should like to have the method in which this finish is obtained. — *W.W.B.*

A.: Practically all maple finishes as shown at the latest furniture exhibitions are thin and apparently part of the wood itself. This, of course, demands perfect surfacing, sponging, and sanding of the wood as a prerequisite for the finish. Practically all of them have a yellow undertone which has as its base, 1 oz. of potassium dichromate per gallon of hot water. This is applied evenly and allowed to dry. Better results in subsequent finishing will follow if this color coat is adequately sanded for evenness of tone by using a split 4/0 or 5/0 paper. The depth of the "light, dull rust color" to be obtained is dependent upon the amount of walnut or brown mahogany stain powder which is used per gallon of hot water as a second coat. This can be only determined experimentally for which reason in developing a formula of this type, I always make up several urnings and panels from the samples of wood used. In this manner much time is eventually saved and satisfaction guaranteed by having a complete formula at hand for the various results shown.

The brown coat may or may not be sanded as desired although I am definitely of the opinion that judicious highlighting, skillfully blended out, does lend considerable charm to this color. The final coats may be one or two thin coats of shellac-mixing lacquer well sanded and with a final coat of four-hour varnish, skillfully brushed or sprayed on so as to give that slight additional depth which thus far can only be secured through the use of varnishes. This last coat should be carefully rubbed out with oil and FFF pumice stone, and while the rubbing sludge still adheres, a handful of clean cotton waste should be dipped in and squeezed free of water and used to produce the fine satin finish or semigloss most suitable for this finish. — *Ralph G. Waring.*

Associations and Conventions

ILLINOIS VOCATIONAL ASSOCIATION MEETS IN CHICAGO

The Illinois Vocational Association will meet November 4–5, at the Hotel Sherman, Chicago, Ill., for its seventh annual meeting. A splendid program has been prepared and an interesting display of school products will be shown. The meeting will divide itself into numerous sectional groups.

The Program

What Art Education is Doing in Vocational Enlightenment and Guidance — B. F. Buck, Norman Rice, and Anne Davis.

How an Industry Looks at Training — Paul A. Mertz, Sears, Roebuck & Company, Chicago, Ill.

Possibilities of General Industrial Courses for Small Cities — Wayne J. Colohan, Woodstock, Ill.

Present Status of Industrial Arts in the Secondary School — Frank T. Vasey, Springfield, Ill.

How to Determine the Content of Related-Subjects Courses — J. W. Paul, Springfield, Ill.

Problem of Organizing and Teaching Related Subjects — Harold Diemer, Granite City, Ill.

A One-Year Course in Architectural Drawing for High Schools — Gilman Lane, Oak Park, Ill.

Architectural Drawing and Design in High Schools — Herbert E. Hewitt, Peoria, Ill.

Guidance and Placement and Follow-up in a Part-Time Continuation School — W. F. Patterson, Milwaukee, Wis.

How a Trade Association Can Assist a Part-Time School Program — A. D. Lynch, Chicago, Ill.

Value of Printing Instruction to the Printer's Customer — Albert T. Hall, Chicago, Ill.

What the Commercial Printer Expects of an Apprentice in the Public Schools — James Van Bladel, Van Bladel Printing Company, Chicago, Ill.

The Student's View of Printing in the Public Schools — Leonard Whitehead, Austin High School, Chicago, Ill.

INDIANA INDUSTRIAL EDUCATION ASSOCIATION MEETS AT LEESBURG

The Indiana Industrial Education Association held its executive committee meeting on August 30, at Stony Ridge Hotel, Leesburg.

It was decided that, although no research studies will be attempted for some time, the term "research" will be used in the formation of committees to start work on the various shop subjects. It is planned to promote a department on instruction sheets, and to solicit materials from teachers for working up into job-sheet form. As soon as possible, it is planned to start active work on a state course of study for all industrial-arts and vocational work.

The next meeting will be held at Indianapolis in conjunction with the meeting of the Indiana Teachers' Association on October 21.

STOUT PRINTING TEACHERS ASSOCIATION

The printing teachers of Stout Institute summer session held their seventh consecutive annual gathering during the past summer, with instructors from fourteen states in attendance. The total membership of this organization is nearly 400, with 85 life-membership enrollments.

The officers elected for the year 1932–33 are: President, L. A. Petersen, Green Bay, Wis.; vice-president, A. E. Melby, Baltimore, Md.; and secretary, Leo Schmitz, Saginaw, Mich.

News Notes

Aviation Class in Night School

A night class in aviation has been established in the Brackenridge Senior High School at San Antonio, Tex. The class has an enrollment of 65 students.

Jobless Attend School

A number of unemployed adults have enrolled in the classes at the Madison Vocational School, Madison, Wis. The total enrollment in the school is 587 students, of whom 346 were over 18 years and 146 under 18 years.

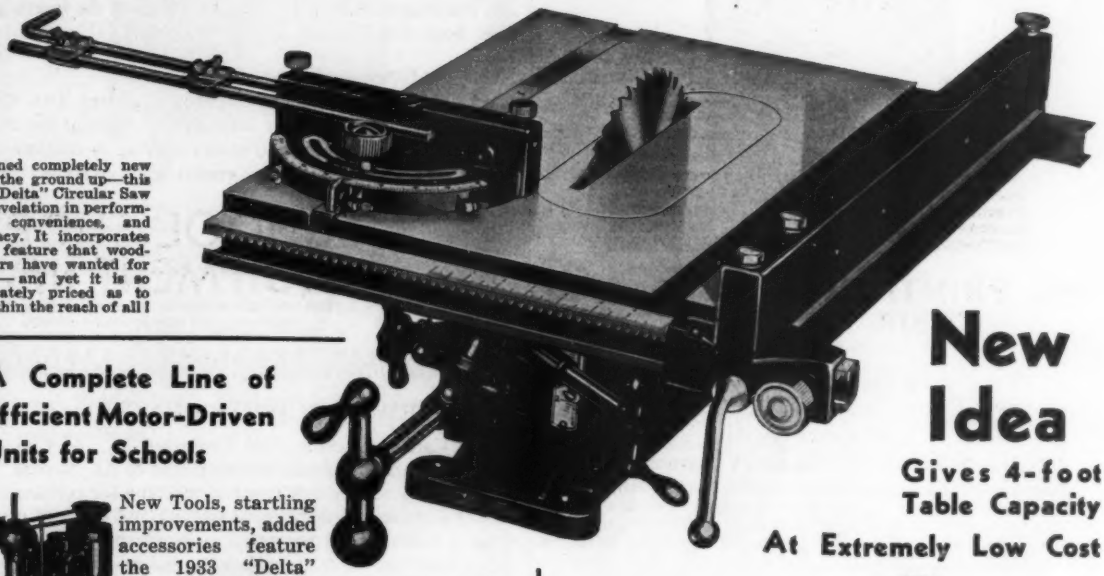
San Antonio Trade School has Large Enrollment

The vocational and technical school at San Antonio, Tex., has reported an enrollment of approximately 1,000 students with the opening of the new school year. In addition to the

(Continued on Page 10a)

New 1933 Delta Tools

Set New Standards for Motor-Driven Units



Designed completely new from the ground up—this 1933 "Delta" Circular Saw is a revelation in performance, convenience, and accuracy. It incorporates every feature that woodworkers have wanted for years — and yet it is so moderately priced as to be within the reach of all!

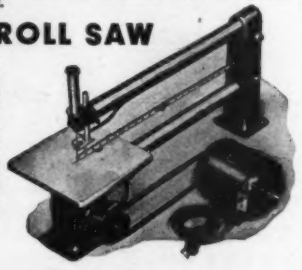
A Complete Line of Efficient Motor-Driven Units for Schools

New Tools, startling improvements, added accessories feature the 1933 "Delta" line of woodworking units. Into each tool has been built the same quality and careful workmanship that has made "Delta" the standard for motor-driven units the world over. The sturdy construction, compact, convenient design, portability, and low initial cost make these "Delta" tools especially desirable for school workshops.

New "Delta" DRILL PRESS

It would take almost a book to describe completely the features, advantages, and range of operations of this sensational new addition to the "Delta" line. Briefly, the new "Delta" Drill Press, measuring 68 inches high and provided with heavy floor base, is a precision tool—built to meet the most exacting demands of production work, and yet priced unbelievably low. It incorporates numerous new features, including Ball Bearing Spindle, Accurate Graduated Chuck, Tilting Table, Enormous Capacity, and many more. It is really two machines in one—as the head can be reversed and used efficiently as a Shaper. Hollow Chisel Mortising Attachments available. For full details see the New "Delta" 1933 Catalog.

New "Delta" SCROLL SAW



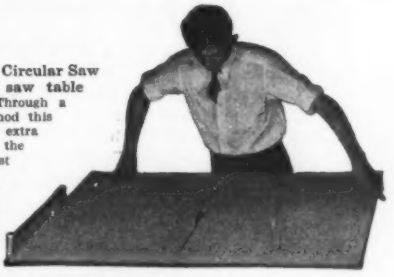
Radically different from any Scroll Saw on the market. It runs at full motor speed—1800 strokes per minute—all springing and twisting eliminated, with perfect balance and absence of vibration. As a result, this remarkable tool produces fine, smooth and accurate work hitherto only possible on a band saw. **Has 24-inch throat capacity and will saw wood 2 inches thick!** Works on metal and fibre as well as wood. Has numerous special features. It can be used for filing, sanding, and honing.

New "Delta" COMBINATION UNITS

"Delta" Combination Units are convenient, portable, and compact. All are mounted on benches or stands—and are available in a large variety of combinations and at prices to fit all needs. These various combinations of "Delta" Tools are described in complete detail in the 1933 "Delta" Catalog. The "Delta" line includes Jointers, Circular Saws, Band Saws, Woodturning Lathes, Drill Presses, Scroll Saws, Boring, Routing, Sanding and Mortising Attachments, and a complete line of accessories.

New Idea

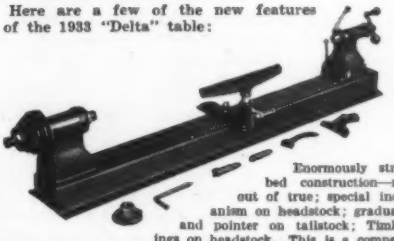
Gives 4-foot Table Capacity At Extremely Low Cost



The 1933 "Delta" Circular Saw provides a large saw table with a vengeance! Through a remarkable new method this new tool gives both extra space in front of the saw, where it is most needed, plus all the advantages of a table 4 feet square, at a fraction of the ordinary cost of a very large table. In addition, this unusual tool offers an amazingly improved Miter Gauge, a new and better self-aligning Rip Gauge, and improved accurate lowering and raising mechanism plus numerous other important new features.

New "Delta" LATHE

Here are a few of the new features of the 1933 "Delta" table:



Enormously strong lathe bed construction—never gets out of true; special index mechanism on headstock; graduated sleeve and pointer on tailstock; Timken bearings on headstock. This is a compact, sturdy lathe that is ideal for manual training work. For full details see the "Delta" Catalog.

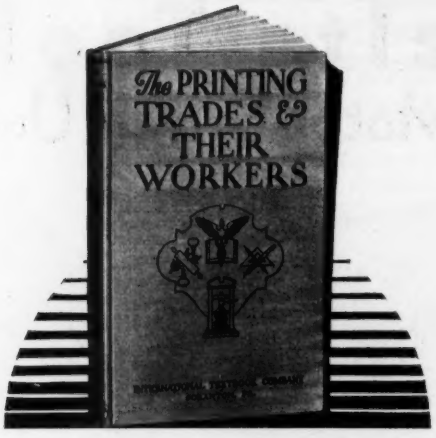
Send for Free Catalog

Every man who works with wood — will want to see this FREE 1933 "Delta" Catalog of Quality Woodworking Tools. It shows the full line of the latest "Delta" Tools. It is packed with interesting illustrations and descriptions. It describes the latest developments in motor-driven equipment at the astonishingly low 1933 price levels. Be sure you get YOUR copy. Address us on your school letterhead—mail TODAY!

Delta Mfg. Co.

3775 No. Holton St., Dept. E 1132

Milwaukee, Wisconsin



THE PRINTING TRADES AND THEIR WORKERS

(Just off the press)

By Florence E. Clark

Counselor, Flower Technical High School, Chicago

In cooperation with the

National Vocational Guidance Association

Many books and pamphlets containing occupational information have been published independently by various educational sources but their adaptability has frequently been limited to the communities where they were written. Educators recognizing the need for improved studies — suitable in schools both large and small — asked for this new Study which was prepared by the N. V. G. A. for the Guidance Field. It is authoritative and presents the information in a most useable manner.

Important for Industrial Arts Classes

Increasing importance is being given in the Industrial Arts Classes to a study of Industries because of its worth as guidance. Greater significance between his school and the work of the world comes to the pupil through his study of the occupational information in THE PRINTING TRADES AND THEIR WORKERS.

Salient Features of this Printing Study

1. Prepared under the supervision of the N. V. G. A.

2. Author has been industrial investigator for U. S. Government; editorial writer for A. L. A. Booklist; and finally, teacher, counselor, and for five years in charge of the Industrial Studies Division of the Vocational Guidance Bureau, Chicago, when several Studies on the Printing Trades were written by her.

3. Specially prepared for (a) Social Science classes in Junior and Senior High Schools, (b) Industrial Arts Printing classes, (c) Printing Apprentices, (d) Vocational Advisers, and (e) School and Public Libraries.

4. Gives Occupational Information in the Printing Trades and pictures the industry in relation to our economic organization.

5. Teaches readers how to gather information for themselves and undertake the elements of simple research.

132 pp., 5x8, 66 illus., cloth, $1.40

Catalog sent on request

INTERNATIONAL TEXTBOOK CO.

INTERNATIONAL TEXTBOOK CO.
Box 8903-B, Scranton, Penna.

Please send me on approval the books checked below:

☐ The Printing Trades and Their Workers
☐ Texts on the following subjects:

.....
.....
.....

I agree to return texts if not adopted or to remit for same.

NAME.....
POSITION.....
SCHOOL.....
ADDRESS.....

(Continued from Page 8a)

old units of the school, two new units have been opened this year. Although the school is a vocational institution, it offers facilities for 200 academic students who do not find it convenient to attend the other senior schools in the city.

New Industrial-Arts Classes

New classes have been added to the industrial-arts work at the Washington School, LaSalle, Ill. Pupils of the fourth grade have been added to the classes this year.

University Extension Courses

The vocational schools at Manitowoc and at Two Rivers, Wis., are offering university extension courses for the benefit of high-school graduates and others desiring to continue their education, or to obtain college credits while at home.

SCHOOL SHOP EQUIPMENT NEWS

FOR THE SUPERVISOR OR TEACHER WHO DESIRES TO KEEP ABREAST WITH THE NEWS OF NEW MACHINERY, TOOLS, SUPPLIES, ETC.

NEW PRECISION BENCH SAW

The Carroll Machine Tool Company, Inc., of Cincinnati, Ohio, has just announced the marketing of its "Redfox" Precision Bench Saw, which is a real machine for performing all sawing and kindred work in an efficient and accurate manner. It is a tool of rigid construction in which every setting or adjustment can be made with ease, quickness, and accuracy.

The table is a one-piece, gray-iron casting with cradles cast integrally. It is supported on a rigid elevator which slides vertically on machined tongues operating in machine gibs. These gib guides are extremely far apart horizontally and offer in addition, very long guides vertically. The fence is a solid, one-piece casting and may be lifted straight up for removal. A quarter turn of the thumbscrew releases the fence

REDFOX PRECISION BENCH SAW

for accurate and easy movement and for shifting to a different position. The saw shaft is ¾ in. in diameter, with a heavy collar at one end against which the saw is clamped. The bearings are turned out of solid bronze stock. The Redfox has a speed of 5600 revolutions which gives 12,000 ft. of surface speed, insuring a free and sure cutting.

NEW SOUTH BEND UNDERNEATH-DRIVE BENCH LATHE

The South Bend Lathe Works, South Bend, Ind., has just placed on the market its new underneath-belt, motor-driven bench lathe. This is a revolutionary type of bench lathe which has a reversing motor mounted under the bench, directly beneath the headstock of the lathe. This new down-pull fea-

(Continued on Page 13a)

ADVERTISING PAGES REMOVED

PRACTICAL POPULAR

DURABLE ECONOMICAL

MANUAL TRAINING BENCHES

Fifty Different Models

A Bench for Every Purpose

Our benches are all made of maple with mortised and tenoned joints glued and bolted. We do not use glued up lumber in the legs, rails or drawer fronts.

Write for full particulars

Manufactured by

THE CHRISTIANSEN COMPANY

2814-42 W. 26th St.

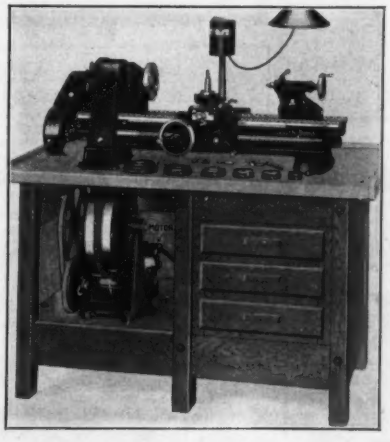
CHICAGO, ILL.

Makers of This Line Since 1897

(Continued from Page 10a)

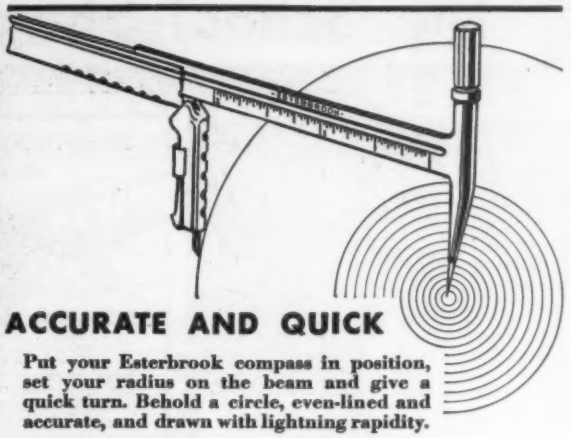
ture insures a steady, powerful, and noiseless drive, making possible the most accurate and precise machining.

The new bench lathe, which is compact, convenient, and safe, is particularly fitted for the machine shop in vocational



NEW SOUTH BEND BENCH LATHE

and technical schools and for experimental and laboratory shops. It is of the back-geared, screw-cutting type, cuts all standard screw threads, and in addition may be used for turning wood, hard rubber, and compositions. A new feature is an easy-reading index plate, which shows at a glance the proper gearing to obtain any one of a wide range of feeds. Other features are six spindle speeds, a drum-type reversing switch, a graduated tailstock spindle, automatic feed, and a precision lead screw.



ACCURATE AND QUICK

Put your Esterbrook compass in position, set your radius on the beam and give a quick turn. Behold a circle, even-lined and accurate, and drawn with lightning rapidity.

No difficulty about closing your circle. No trouble about matching ends. The circle from an Esterbrook compass is always perfect.

Visible radius, easy operation, sturdy design rate the Esterbrook compass as perfect as the circles it makes. And it costs only 25c.

ESTERBROOK PEN COMPANY, 78 Cooper St., Camden, N. J.

or Brown Bros., Ltd., Toronto, Canada

Esterbrook

COMPASS

Fay-Egan **WOODWORKING MACHINES FOR SCHOOLS**

The Fay-Egan Line of Safety-Sealed, All Electric Woodworking Machinery for modern classroom instruction is complete, including:

LATHES	BAND SAWS	JOINTERS
SURFACERS	SCROLL SAWS	MORTISERS
VARIETY SAWS	BORERS	GRINDERS
	SANDERS	

Send for portfolio illustrating and describing modern woodworking machines for schools.

The choice of leading vocational and technical schools throughout the United States and foreign countries

J. A. FAY & EGAN CO.

2728-2848 Robertson Ave., Oakley, Cincinnati, O.

LEATHERCRAFT

For Christmas Gifts

Book End

Scores of beautiful and useful articles may easily and quickly be made from leather. This craft is fascinating to both pupils and teachers and is an ideal medium for creative and artistic expression. Everything which teachers or pupils need can be furnished at small cost—craft leathers, tools, patterns, instructions and all accessories.

Send for free illustrated price list and sample card. Leathercraft Instruction Book and Supplement may be had for 50 cents.

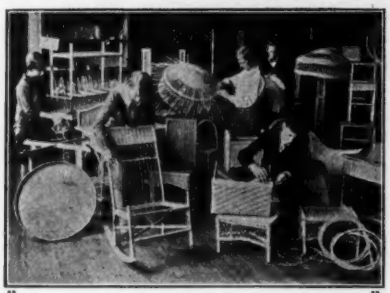
LEATHERCRAFT STUDIOS

DEPARTMENT G-32

GRATON & KNIGHT COMPANY

WORCESTER, MASS.

The School Shop Shopping Guide



Teach Art-Fibre Furniture Weaving

Reduce Operating Costs Without Impairing Educational Standards

Weaving is acknowledged as the ideal hand training medium and Art-Fibre Furniture Weaving is the most practical form of this valuable art. Results are quick and positive. Enthusiasm is kept at a high pitch, classes are attentive and parents cooperate because the finished project is a welcome addition to their home furnishings.

Only a few simple household tools are used. Power bills and expensive machinery are eliminated. All expense is for materials and these are sold at the lowest prices in history.

Investigate This Timely Work

Write for our 1933 catalogue of Designs and Materials illustrating nearly a hundred furniture projects your classes can make.

Address Department "A"

GRAND RAPIDS FIBRE CORD COMPANY
609 Myrtle Street, N.W.
Grand Rapids, Michigan

TRAINING TEACHERS
Attention!

MODELS

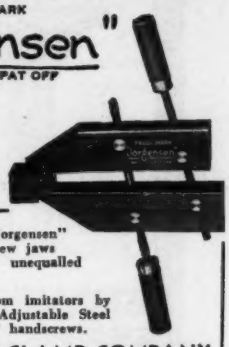
We are offering special concessions to teachers to acquaint them with the superiority of Selley's Construction Kits of scale and flying models for class work.

Please send in for FREE catalogue of the worlds' finest model airplanes and accessories—without obligation.

SELLEY MANUFACTURING CO.
1377 A Gates Ave. Brooklyn, N. Y.

TRADE MARK
"Jorgensen"
REG U S PAT OFF

Look for It



The name "Jorgensen" stamped on handscrew jaws is a guarantee of unequalled quality and service.

Protect yourself from imitators by specifying Peerless Adjustable Steel Spindle "Jorgensen" handscrews.

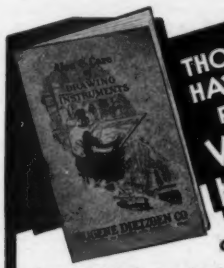
ADJUSTABLE CLAMP COMPANY
424 N. Ashland Ave. Chicago, Ill.

COLARK'S MINIATURE
SPINNING WHEEL
$1.00 POST PAID

Furnished ready for assembling. Each part carefully cut to exact size, smoothly sanded so it can be colored or enameled. Elegant for mantel or radio, beautiful gift for the holidays. Can easily be equipped with lamp and shade. Send check or M. O. with order.

SIZE
Height Overall 10½"
With Oval Base 8½" x 6½"

COLARK SHIP MODELS
Dept. "S" 6330 N. Gratz St., Philadelphia, Pa.



THOUSANDS HAVE ASKED FOR THIS VALUABLE HANDBOOK

THOUSANDS OF INSTRUCTORS

have distributed many hundreds of "Use and Care of DRAWING INSTRUMENTS" to their classes.

Saves time for Instructor and Student for it quickly acquaints student with tools he is to use. It tells how each instrument is used.. how to properly care for them.

SEND FOR A SUPPLY. FREE FOR DISTRIBUTION TO YOUR ENTIRE CLASS.

EUGENE DIETZGEN CO.
Enduring worth at reasonable cost

Chicago · New Orleans · San Francisco · New York · Pittsburgh · Philadelphia · Milwaukee · Washington · Los Angeles · Factory at Chicago

Manufacturers of Drafting and Surveying Supplies

Printers Supplies

Safety appliances for Platen Presses; Gideon Grippers; Ink Rollers; Complete Printing Plants—Outfits for schools or students. Write for catalog. Another source of supply

Globe Type Foundry, Est., 1904

523 SOUTH GREEN STREET CHICAGO ILLINOIS

FREE—2 Books on ARCHERY
WRITE FOR YOURS TODAY

We specialize in Raw Materials for Schools — Tapered Lemonwood Staves — Arrow Material Sets — Feathers, Points, Shafts

WOODCRAFT EQUIPMENT CO.
Archers Court Independence Mo.
(Greater Kansas City)

LIBITE *Instantaneous*
Type Cleaner & Ink Remover

Performs a miracle in rapidly removing ink and other accumulations from type forms, plate base, electros, halftones, ink fountains and for all general wash-up purposes. Qt. $1—Gal. 2.50—5 Gal. @ $2

PERFECTION TYPE, Inc.
702 Manhattan Bldg. - St. Paul, Minn.

ELECTRO-TYPERS

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

The master automotive trade text

AUTOMOTIVE SERVICE

Ray F. Kuns

●

By far, the most inclusive, most thoroughly illustrated, single volume ever to be published for students of automotive mechanics. It comprises some 1136 pages and includes over 1100 illustrations. Modern, detailed, understandable, it is the *one* automotive trade text you need.

Price, $6.50

●

The Bruce Publishing Company
524-544 N. Milwaukee St. Milwaukee, Wis.

PEWTER
AND BRITANNIA METAL

Sheets: 24"x36" or smaller
Circles: 2" to 24" diameter
Specify size and gauge.

NATIONAL LEAD CO., DEPT. P
New York Chicago St. Louis

BASKETRY SUPPLIES
FIRST QUALITY

Reeds, wooden bases, raffia, chair cane, ash splints, pine needles, etc. Dyes, tools and books of instruction. Free price list.

FLORENCE M. ALEXANDER
606 California St. Newtonville, Mass.

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair, Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

E. B. & A. C. WHITING CO.
Burlington, Vermont

The School Shop Shopping Guide

Woodturnings

Screw Hole Buttons & Plugs 3/8", 7/16", 1/2" Dia. | Drawer Stops 5/8" Head 5/16" or 3/8" Tenon

Dowels

Plain or Spiral Grooved Hardwood Pins and Rods

Buy direct from the Manufacturer

Stephenson Mfg. Co.
240 Tutt St. South Bend, Ind.

SUPPLIES
for Metal Shop Projects

ORNAMENTS—Stamped and Forged—
MOULDINGS—Steel and Aluminum—
TUBING—(Steel) Square, Twisted, Etc.—
BARS—Genuine Puddled WROUGHT IRON—
PERFORATED SHEETS AND MISCELLANEOUS SUNDRIES

$1.00 for SAMPLE ASSORTMENT of 25 stamped leaves, husks, rosettes, etc., furnished postpaid to points within 500 miles of Chicago.

To points more than 500 miles from Chicago, add $.25.

J. G. BRAUN CO.
609-615 So. Paulina St. CHICAGO

READ QUICK! LOOK!

COMET

MODEL AIRPLANE SUPPLIES!

We guarantee 24-hour service, and satisfaction guaranteed or your money back! Order your model airplane supply requirements where you get fastest shipment, best quality, low prices on genuine Jap tissue, rubber, dope, famous Comet cement, bamboo, balsa wood, etc. Quick! Order now and see for yourself! FREE 24-Page colored Catalog of supplies, kits. COMET MODEL AIRPLANE & SUPPLY CO., 3114 Harrison, Dept. IA-S 122, CHICAGO.

NEW Celluloid Formed "PROP"!

BANISHES CARVING JOB!

Ready formed with shaft. Looks realistic. Colored, super-pull! Write us today for complete Catalog. Special Discount!

24-HOUR SERVICE!

SATISFACTION Or Your Money Back!

FINISHING SUPPLIES

Stick Shellac—Waxes—Lacquer—Varnishes—Stains—Glue—Remover—Campbell Finishes and Repair Specialties are used by Furniture and Piano Finishers everywhere.

Ask for catalog and descriptive literature

THE M. L. CAMPBELL CO.
2906 East 13th St. Kansas City, Mo.

TYPE-ETCHING

Typewritten matter reproduced on metals. Simple, inexpensive, easily done. Eliminates necessity for skill in lettering. Ideal for marking tools. Introductory offer, material with instructions for Type-Etching your name 100 times, fifty cents. For additional information address

TYPE-ETCHING CO.
209 Pine St. N.E. Atlanta, Ga.

BUILD BOATS

Motors, Parts, Accessories
Redwood Blocks, Complete Kits
Write for Catalog and new Prices

LIBERTY PLAYTHINGS
Dept. A Niagara Falls, N. Y.

Fay-Egan WOODWORKING MACHINES FOR SCHOOLS

The Fay-Egan Line of Safety-Sealed, All Electric Woodworking Machinery for modern classroom instruction is complete, including:

LATHES	JIG SAWS	SHAPERS
BORERS	BAND SAWS	TRIMMERS
SANDERS	SCROLL SAWS	GRINDERS
PLANERS	VARIETY SAWS	SAWS
JOINTERS	TILTING TABLE SAWS	KNIVES
SURFACERS	SAW BENCHES	CUTTERS
MORTISERS	BENCH MACHINES	SUPPLIES

COMBINATION WOODWORKERS

Send for portfolio illustrating and describing modern woodworking machines for schools.

The choice of leading vocational and technical schools throughout the United States and foreign countries

J. A. FAY & EGAN CO.
2728-2848 Robertson Ave., Oakley, Cincinnati, O.

Now - Dustless Sanding

with new Take-About Sander. Quickly refinishes desks, tables, benches, blackboards. Pays for itself, also valuable on large shop projects, because belt insures smooth, flat surface. Four models to choose from. Bench stand converts it into Edge Sander. Write for Porter-Cable bulletin and abrasive chart to-day. Ask about our 20 other machines. We cater to schools.

PORTER-CABLE-HUTCHINSON CORP.
1702 N. Salina St. Syracuse, N. Y.

INDEX TO ADVERTISEMENTS

Abernathy Vise & Tool Co.. 4a
Algoma Plywood & Veneer Co. 4a
American Saw Mill Machinery Co. 3a
American Type Founders Co. .....4th Cover
Badger Electrotype Co. ...14a
Bemis, A. L..... 2a
Braun Company, J. G.....15a
Bruce Publishing Company, The....2nd Cover, 3rd Cover
Carter Company, The R. L. 3a
Casein Manufacturing Co...12a
Colark Ship Models 14a
Columbian Vise & Mfg. Co., The 11a
Comet Model Airplane & Supply Co.....12a, 15a
Delta Specialty Company.. 9a
Dietzgen Company, Eugene.14a
Dixon, Inc., William.....16a
Fay & Egan Co., J. A.....15a
Fellowcrafters 12a
Grand Rapids Fibre Cord Co. 14a
Hall, W. A..... 2a
Hoke Engraving Plate Co..14a
Home Craftsman, The.....11a
International Textbook Co.10a
Johnson Gas Appliance Co. 7a
Klise Manufacturing Co... 2a
Lumber Dealers Directory.. 2a
Marqueterie Corp.....14a
McGraw-Hill Book Co., Inc. 3a
Metal Crafts Supply Co...12a
Morgan Vise Company.... 2a
Mummert Dixon Co.....16a
New Britain Machine Co..16a
Oliver Machinery Co..... 1a
Outdoor Amusement Co....12a
Pease Company, The C. F.. 6a
Pep Mfg. Company.....12a
Porter-Cable-Hutchinson Corp. 15a
Post Company, Frederick..13a
Rockford Machine Tool Co. 7a
Ruleta Company, Inc., The.12a
Russell Electric Co.....12a
School Shop Shopping Guide 12a, 14a, 15a
Selley Mfg. Company, Inc..14a
South Bend Lathe Works.. 7a
Stephenson Mfg. Co.....15a
Thurston Supply Company.16a
Wallace Company, J. D.... 4a
Western States Envelope Co. 11a
Yates-American Machine Co. ..... Insert

PLURALITY OILSTONE TOOL GRINDER
Meets School Shop Needs

Now in **Available 3 sizes**

No. 475 PLURALITY

Here is the most efficient, serviceable and convenient tool sharpening machine ever made. Now in three sizes to suit every need. Combines five basic units in one: *Coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, and emery wheel*—Compact—Easily Accessible. Especially guarded for school shop use. Has ball bearing direct motor drive.

Write for detailed information.

MUMMERT-DIXON CO.
HANOVER, PA.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

Send For It!

IF YOU ARE AN INSTRUCTOR IN THE METAL ARTS YOU NEED THIS CATALOG

THE new Dixon Catalog has been under preparation for months, and will be issued in January, 1933. It is the most comprehensive catalog you have ever seen covering Arts and Crafts Tools and Supplies. It contains explanations of processes and text book features valuable to teachers. It also features Linoleum Block Printing, Leather Crafts, Wood Carving, Lapidary Work and Model Making, with sections devoted to Chasing, Repousse, Etching, Enameling, Electro-Plating, etc.

To Teachers or School Purchasing Departments the book will be sent Free. To others, a charge of $1.00 will be made. This will be credited against any initial purchase of $5.00 or more, made within one year.

Register Your Name And Address NOW To Receive This Book When Issued.

WILLIAM DIXON INCORPORATED
34 E. Kinney Street, Newark, N. J.

NEW BRITAIN
STEEL EQUIPMENT FOR SCHOOL SHOPS

NEW BRITAIN — NB — NONE BETTER

LOOK For this TRADE MARK

It Stands for Safe, Sanitary, Durable, and Economical Steel Equipment

The Type "O" Leg is used on all New Britain School Shop Equipment, such as Manual Training Benches, Drawing Tables, Work Benches, Stake Benches, Cabinet Benches, Welding Benches, etc.

Type "O" Tubular Steel Sanitary Bench Leg

Send for Complete Catalog

The New Britain Machine Company
"Shop Furniture Originators" — New Britain, Conn. U.S.A.

Eighteenth Annual Catalog

"Hard-to-Get" Materials

How Often Have You Wished to Find a Source of Supply for the Following?

Upholstering materials and supplies, finishing materials, mirrors, Sloyd knives, candlestick sockets, foot rests for shoe blacking boxes, electric bridge arms and clusters, furniture slides, bed rail fasteners, office chair fixtures, decorative transfers, smoker trimmings, furniture legs, tea wagon wheels and casters, furniture mouldings and pressed ornaments, chest trimmings of every kind and description, casters in large variety, wood dowels, nut bowl fittings, billboard clamps, screw hole plugs, knobs, pulls, catches, hinges, costumer hooks, tray handles, desk lid supports, chair cane and reeds, table slides, folding card table fittings, corner braces, steel rails for wood beds, table leaf supports, spring clock movements, electric clock movements for both mantel and grandfather clocks.

All the above and many more at wholesale prices.

Catalog Free for the Asking.

Thurston Supply Co.
Anoka **Minnesota**